BUILD IT
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HEAD TO HEAD
Ultrabook vs. Tablet: We pick the winner in a brutal five-category showdown

REVIEWED
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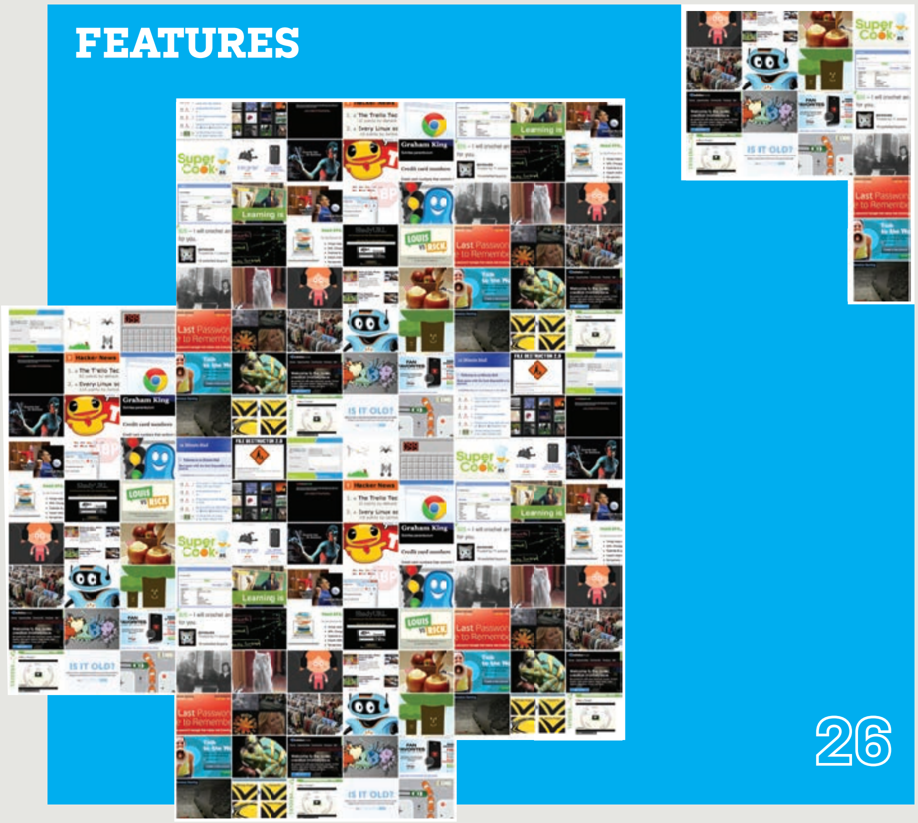

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Gordon Mah Ung

HANDY ANDY STILL REMEMBERED

LONG-TIME READERS of *Maximum PC*, and those who knew the mag in its prior life as *boot*, may well remember Andrew Sanchez, but I'm betting that the vast number of you don't know his story. You likely know him as a name on our masthead and wonder what it took to get Editor Emeritus status.

Andrew was a long-time editor who epitomized everything the magazine has come to represent: performance computing without compromise. When he reviewed a game, normal and wussy levels were not allowed. "Dude, I always play through on hard," he told me. He was never afraid to say a product was bad, nor—just as importantly—was he afraid to sing a good product's praises. Even if the conventional big tech media pooh-poohed a product based on such silly metrics as price alone, Andrew recognized that an emphasis on performance itself deserved recognition. He was, simply, a nerd's nerd.

He could bend benchmarks to his will and overclocking was second nature to him. I can still remember the day he related how he was able to overclock a Pentium II in Intel HQ during a demo—right under their frigging noses! Mind you, this was in the days when Intel viewed overclocking as a "dark art," or classified information, and something to be actively discouraged. It was as though Andrew had crept into the dragon's lair and tied its tail in a knot.

Unfortunately, Andrew "Handy Andy" Sanchez passed away unexpectedly on February 6, 1999 (an anniversary which I somberly observe by writing this column). Andrew was indeed the heart and soul of our magazine, and we thought we'd never survive his passing. But life goes on and so does the passion that drove him.

Like all those who leave our ranks, I like to imagine running into them on the street and catching up on the latest (something you don't really do in the social media age anymore). Andrew, I'm sure, would be tickled pink to hear that Intel is actually offering overclocking protection for its chips. And—for real, Andrew—Duke Nukem *finally* came out and it was, well, everything you predicted it would be.

Andrew Sanchez

Well, Andrew, we're still here and the things you so believed in—fast computers and good products—are still our mantra. Sure, we have tablets now and super-thin notebooks and phones that would make you laugh out loud at your original Palm Pilot, but fast PCs still matter. So here's to you, Andrew—we'll keep your screwdriver handy and a case cracked open for you.

Gordon Mah Ung is Maximum PC's deputy editor, senior hardware expert, and all-around muckraker.

↘ submit your questions to: comments@maximumpc.com

THE NEWS

Megaupload's Mega Takedown

Was the U.S. government's shuttering of the popular file-sharing site a one-shot deal or a sign of things to come?

JANUARY 19, 2012: The 'net had barely flipped the lights back on after holding a historic blackout protest against the SOPA/PIPA legislation winding its way through Washington halls. Millions of people lent their voices to the cause. Congratulatory messages flowed like wine, and virtual high-fives were e-tossed about with wild abandon.

That day, with the blackout still looming large in the collective consciousness, the U.S. government shut down Megaupload, one of the most popular file-sharing sites on the web.

Seven people were charged with crimes ranging from criminal copyright infringement to conspiracy to commit racketeering and money laundering. Four of the seven charged were arrested in New Zealand and prepared for extradition, including Megaupload founder Kim Schmitz (aka Kim Dotcom). Megaupload's financial assets and server data were seized around the globe.

Things look bad for Megaupload. But what does the takedown mean for the rest of us?

Dealing with ramifications: Visitors to Megaupload.com are greeted by a government seizure notice.

ALL YOUR FILES ARE BELONG TO US

The government will need to produce evidence to convict Kim Dotcom and his cohorts—but Megaupload's sudden closure also left scads of legitimate users unable to access their noninfringing files. Overnight, millions of files disappeared. Disgruntled users threatened to sue the FBI.

The government's response? Too bad, so sad. "Megaupload.com expressly informed users… they assume the full risk of complete loss or unavailability of their data," a Justice Department spokesman told DigitalTrends.com. The government then gave Carpathia and Cogent, the companies that hosted Megaupload's U.S. servers, permission to delete users' data if they so desired. Fortunately, rather than blindly wiping its drives, Carpathia began working with the Electronic Frontier Foundation to determine an appropriate course of action. Cogent also declined to purge data immediately.

Julie Samuels, a staff attorney with the EFF, says, "The lack of due process is troubling."

CYBERLOCKERS STOP BEING SOCIAL

Other file sharing services battened down hatches in the wake of Megaupload's shuttering, anxious to avoid the wrath of the U.S government. According to TorrentFreak.com, FileSonic, FileServe, FileJungle, and UploadStation disabled any file sharing whatsoever; users can only access files they uploaded themselves. Most cyberlockers have disabled or are in the process of disabling their affiliate rewards programs for uploading widely shared files. Two foreign sites, x7.to and UploadBox, shut their doors completely, while Uploaded.to blocked all user access from within the U.S.

Samuels thinks Megaupload's well-publicized seizure will produce "a chilling effect on the future of these kinds of services." Venture capitalists could have less incentive to invest in cloud storage services, despite their legality, while everyday PC users—think moms and grandmoms—will likely be more tentative to dive whole-hog into the cloud.

SOPA, PIPA, AND THE FUTURE

So Megaupload's takedown was obviously timed to coincide with the SOPA/PIPA protests, right? Well, nothing concrete points to that, but Samuels and many others find the timing *mighty* coincidental. She doesn't think Megaupload will be the last site to fall to the government's shoot first, go to trial later, pro-copyright campaign—even if SOPA and PIPA do die on the vine.

"This is not the first domain seizure we've seen," Samuels says. "Just the most visible." **–BRAD CHACOS**

OnLive Desktop Weasels Win 7 onto iPad

Streaming game service provider OnLive is expanding its presence with "a seamless Windows desktop experience" on the Apple iPad, with iPhone, Android, Mac, and PC to follow. OnLive Desktop VDI (virtual desktop infrastructure) provides access to a cloud-based Windows 7 environment "with full-featured Microsoft Office applications and 2GB of free cloud storage for secure file access anywhere," according to CEO Steve Perlman.

A paid service called OnLive Desktop Pro is coming soon for $9.99 a month. It will include 50GB of cloud storage and the ability to add PC apps. The company also announced a third, IT-managed service tier called OnLive Enterprise. **–PC**

Roll out the Welcome Mat for 802.11ac

A fifth-generation Wi-Fi standard is emerging as you read this, and 802.11ac promises wireless speeds of up to 1.3Gb/s. While the standard is still developing, Broadcom is already shopping four AC chips to vendors. Broadcom VP Michael Hurlston expects AC routers to launch mid-2012, with compatible TVs, set-top boxes, smartphones, etc., before the end of the year. Market-research firm In-Stat predicts it will be the dominant standard no later than 2015.

Besides blazing speed, 802.11ac supports up to eight spatial streams (802.11n supports four) and operates entirely on the less-congested 5GHz band. Supposedly, it will dramatically improve the wireless range, as well. **–MR**

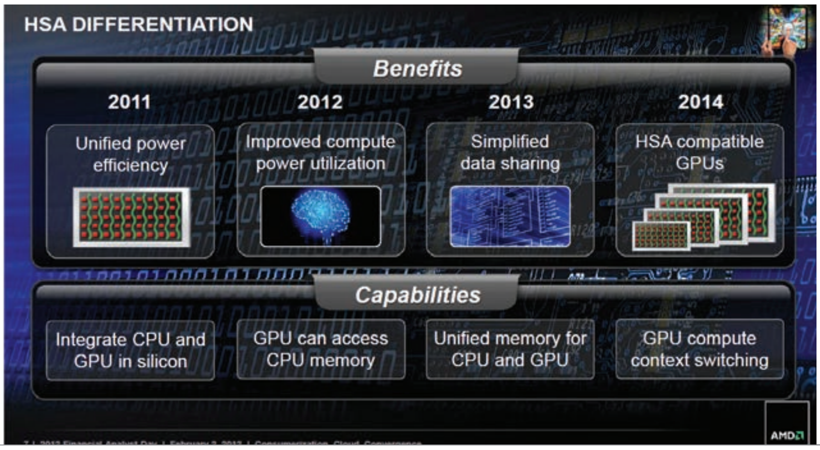
AMD Dishes Roadmap Info and More

If people thought AMD's future was dim, they probably should have told the company. AMD says this year will see a sequel to its hit Brazos chip, a big update to Llano, and a push to further integrate the GPU and CPU.

In 2012, we'll see Brazos 2.0 with Turbo Core modes and native USB 3.0, as well as an ultra-low-power iteration of the chip, code-named Hondo. Hondo is expected to consume about 4.5 watts. We'll also see the sequel to Llano this year. Known as Trinity, it will bring 25 percent more x86 performance, 50 percent more graphics performance, and it will have far lower power requirements. Performance desktops will get some love from the new FX chip, code-named Vishera. Vishera will use the new Piledriver cores, which are the second iteration of the Bulldozer cores in the current FX chips.

In 2013, Seal Islands will arrive, as will Trinity's replacement, called Kaveri, and a replacement to Brazos 2.0, code-named Kabini. The 2013 replacement for Hondo is code-named Temash and is expected to cut power to 2.5 watts.

The company's most exciting initiative, however, is its Heterogeneous System Architecture. This multi-year plan involves the deep meshing of a CPU with a GPU to enable easier programming. AMD plans to let the GPU access the CPU's memory, and eventually even let the two use the same memory address registers, which will simplify programming models for the chips. HSA even includes the ability to add third-party intellectual property, such as an ARM core, to the chips if needed. **–GU**



Tom Halfhill
Fast Forward

THE RISE OF PROGRAMMABLE CAMERAS

CELL PHONE cameras threaten to make digicams and camcorders as obsolete as typewriters. Of course, the main reason is that people are more likely to carry a phone than a camera. But another reason is that camera phones are programmable in ways that conventional cameras (and typewriters) are not.

Smartphone users are enjoying a bounty of new apps that enhance the experience of using their built-in cameras. Many apps replicate the basic image-editing features of programs like Adobe Photoshop, but others are more creative. You can make your photos look like faded Polaroid prints or 150-year-old tintypes. You can "uncrop" your too-tight compositions. You can even do extreme makeovers of your friends' faces and add fake tattoos to their body parts.

Although many digital cameras also have some post-processing features, they are preprogrammed at the factory. You can't install new apps or write your own. (The Canon Hack Development Kit [CHDK] is just that—a limited hack, not a true open platform.)

Sure, you can move your image files to a PC and use Photoshop. But that's an extra step and isn't as much fun as blinging your photos in the moment. Essentially, today's digital cameras aren't far removed from yesterday's film cameras. The camera companies are making computers but are locking down the distinguishing feature of a computer—programmability.

As a result, camera phones are rapidly evolving, tapping new wells of creativity and enjoyment. In fact, camera phones are so much fun that people will sacrifice quality (as judged by traditional photographic standards) for handiness and versatility.

The camera companies should be worried. They are losing the mass market of snapshooters while alienating advanced photographers with clumsy designs. To stay relevant, they should open their platforms to the world's programmers, who are far more creative than their own engineers.

Tom Halfhill was formerly a senior editor for *Byte* magazine and is now an analyst for *Microprocessor Report*.

Thomas McDonald
Game Theory

PURPLE DRAGONS: THEY'RE NOT JUST FOR KIDS

WHEN SKYLANDERS: Spyro's Adventures arrived, I filed it under "kids' games" and let my daughter take the first crack at it. As I watched her play, what caught my eye—and what caught the eye of a significant segment of the juvenile game-playing public—were the toys that made a standard action game into something new. When you place a little plastic figure on a powered base, that figure enters the game. Using a readable/writable RFID chip, the base identifies not only the figure, but its stats and level progress, and this data stays with the figure, allowing it to be used on any system or platform.

It's a remarkably clever use of technology that completely alters the gameplay experience, and we have not seen the last of it. Skylanders was a risk for Activision, which can afford to take this kind of risk. Spyro was a dead franchise, and the company might well have found itself, on December 26, sitting on a warehouse of tiny, plastic purple dragons. Instead, it found itself facing sold-out stocks and outraged fans forced to pay scalper prices for hot, hard-to-find figures. This was particularly aggravating because portions of the game are only accessible through certain kinds of figures.

Leaving aside the ethics of selling a game that functionally locks out portions of itself until you buy additional hardware, it's hard to deny the brilliance of the approach from either a marketing or fan-experience perspective. Adults who thought they were immune to this kind of toy-driven experience soon found themselves just as hooked as the kids.

Because our entertainment is wholly screen-based, we tend to forget the importance of the tactile element. In ye olden days of gaming we had absurdly lavish and unnecessary Thrustmaster peripherals to help capture the authentic look and feel of flying or driving. Designers have spent a lot of time trying to erase the barrier between user and game by streamlining controls and providing full-screen perspectives. Now that they've accomplished that, maybe it's time to back up a bit and consider restoring a tactile element to electronic gaming. Purple dragons are as good a place to start as any.

You can follow Thomas McDonald on Twitter: @StateOfPlayBlog.

IBM Creates Bit of Memory with 12 Atoms

Computers and processors are getting smaller; why shouldn't hard drives? Well, IBM's working on it. Its researchers have successfully stored information in just 12 magnetic atoms. It takes close to a million atoms for current HDDs to store a bit.

IBM's January announcement explained that "scientists used a scanning tunneling microscope to atomically engineer 12 antiferromagnetically coupled atoms that stored a bit of data for hours at low temperatures. They demonstrated the ability to pack adjacent magnetic bits much closer together than previously possible. This greatly increased the magnetic storage density without disrupting the state of neighboring bits." Being dense is a good thing. **–BC**

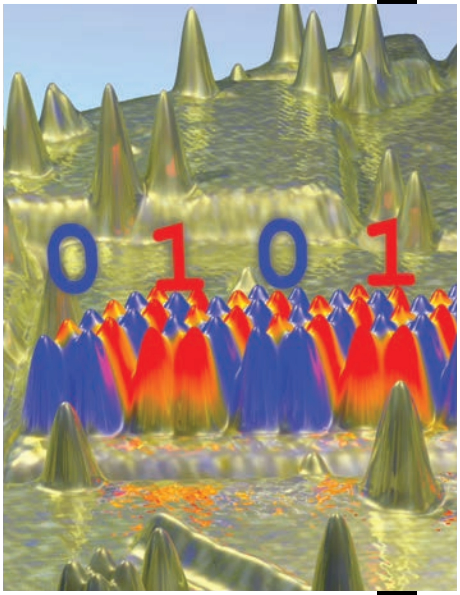


Image source: IBM Research, Zurich

Supreme Court: GPS Tracking Is a Search

The U.S. Supreme Court ruled in January that the Fourth Amendment precludes law enforcement from attaching GPS tracking devices to vehicles without a warrant. The government's position was that a GPS tracker was not a "search," but the court disagreed in a rare unanimous decision.

The court stopped short of saying that a probable-cause warrant was required in all circumstances, but by classifying GPS tracking as a "search" under the Fourth Amendment, it has set a powerful precedent. Police likely will seek warrants more often in order to avoid these questions in future cases. **–RW**

Invest in SSDs and Flash Memory Now

At CES 2012, you'd sooner find a secluded place to sit and quietly eat lunch than a computer maker not launching an ultrabook. At least 20 ultrabook models were unveiled at the annual tech brouhaha, and that—along with other product segments—should lead to explosive growth in the shipment of solid state drives and their NAND flash memory chips. Analyst firm IHS iSuppli predicts a massive surge in cache SSD shipments from 881,000 in 2011 to a whopping 25.7 million in 2012, with steady growth to more than 120 million units in 2015. Cache SSDs will also enjoy greater demand from standard laptops and desktops, not just ultrabooks.

Meanwhile, the NAND flash memory that SSDs require will see nonstop demand also from smartphones, wireless mobile storage devices, set-top boxes, and other categories. Considering that Intel promised more than 60 new ultrabook models by the end of 2012, it's high time to pluck up some shares in a NAND foundry. **–MR**

Lenovo IdeaPad Yoga Ultrabook

Quinn Norton
Byte Rights

MEGA DAMAGE

WHEN MEGAUPLOAD was shuttered in January, it was as if a billion files suddenly cried out at once and then were silenced. The ripples of the indictment from the Eastern District of Virginia were felt all across the net.

Prosecutors indicted several principles, including the flamboyant Kim Dotcom for inducement of copyright infringement, and several charges related to copyright. The problem with rushing into a birthday party with a battalion of police to arrest a guy living like a Columbian drug lord in sheep-y New Zealand, as awesome as it may be visually, is that inducement and secondary liability are civil charges in America. It might only be his tackiness that rose to the level of criminality. Making contributory copyright a crime was part of the now failed SOPA/PIPA effort—and therefore explicitly rejected by Congress. Leaving aside the scary problems of Dotcom and crew not being American, and the implications for cloud storage, it's likely no actual crime was committed. Megaupload may or may not have done enough to comply with DMCA provisions in the U.S.—it definitely did *some* despite not being a U.S. company—but that's still something you get sued for, not pressed into the ground and cuffed for. The government is going to have a hard time proving intent, that the people from Megaupload charged were trying to break a law that didn't explicitly exist when they allegedly broke it.

So why bother if the case is going to be so hard? The real effects were immediate: Average users pulled back from the cloud, and other file-locker companies voluntarily shut down or further fragmented the net by cutting off American IPs. Everything about Megaupload was over the top, including its prosecution. This case serves an industry that believes the Internet is its enemy by damaging the Internet.

Quinn Norton writes about copyright for Wired News and other publications.

Windows 8 Watch

The Picture Clears for ARM Systems

After both Nvidia and Texas Instruments showed prototype ARM tablets running Windows 8 at CES, the industry vibe is that Windows 8 on ARM is stable enough for a developer preview to roll out before spring. Much excitement centers on Windows 8 tablets, and ARM-based ultra-thin laptops could stir the pot by offering lower power consumption and prices compared to Intel-based ultrabooks.

However, some limitations will hobble ARM Windows 8 machines. They won't support legacy software, and they will not be able to turn off Secure Boot, meaning that users may not be able to put Linux distros or Android onto Windows 8 ARM systems.

Microsoft also recently laid down hardware requirements for Windows 8 tablets. For example, they must have keyboard and pointing-device expansion, at least 1366x768 screen resolution, and at least five hardware buttons: power, rotation lock, Windows key, and volume up/down. The alternative to Ctrl+Alt+Delete will be Windows key+power. **–MR**

Symantec Sued as a Scammer

Antivirus programs like Symantec's Norton line are designed to ferret out malicious programs and kick them to the curb. However, one unhappy user claims that Symantec is nothing better than a scareware-peddling scammer, and he has slapped the company with a class-action suit.

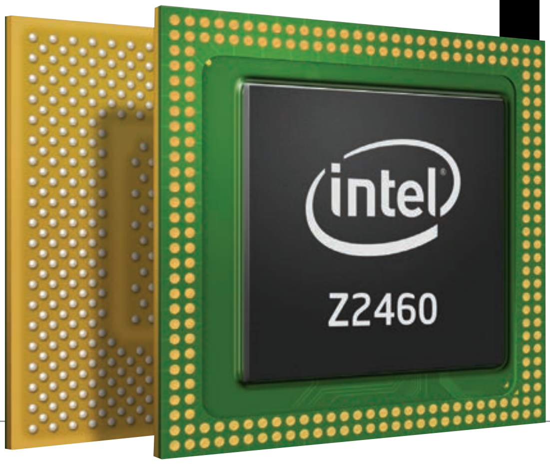
James Gross says that Symantec's PC Tools Registry Mechanic, Performance Toolkit, and Norton Utilities software claim, "in an extremely ominous manner, that harmful errors, privacy risks, and other problems exist on the PC, regardless of the real condition of the computer."

After Gross paid $30 to fix problems Registry Mechanic found, "computer forensics experts" he hired told him that Symantec programs always say that systems have issues. Gross says that Symantec knows the tools' claims of "Low System Health" and "High Priority Errors" are false.

Of course Symantec, which has been criticized for its heavy-handed scare tactics before, disagrees. **–BC**

Intel Expands Mobile SoC Plans

In the second half of 2012, x86 processors will finally make their way into smartphones, as both Lenovo and Motorola will uncork handsets powered by the Atom Z2460—aka Medfield—platform. Intel flaunted a multi-year strategic relationship with Motorola Mobility at CES for producing Atom-based smartphones and tablets, and Lenovo's K800 Android phone with Atom will debut in China.



However, Intel won't rest on those laurels. The processor giant has also issued plans to develop a system-on-a-chip with integrated 4G capability at an unspecified date. Nvidia also plans to integrate 3G/4G radios into its next-gen Tegra chip. **–MR**

THE LIST

8 GADGETS WE'RE LOOKING FORWARD TO THIS YEAR

8 SOLARFOCUS SOLARKINDLE

A Kindle case that doubles as a solar charger—you should never have to plug in your e-reader again.

7 NOKIA LUMIA 900

Windows Phone users, rejoice! The Nokia Lumia 900 offers a 4.3-inch Super AMO-LED display; an 8MP camera; and support for AT&T's LTE network.

6 NVIDIA GTX 600/700 SERIES

With AMD's 7000 series Radeon raising the bar, we are looking forward to Nvidia's response.

5 LENOVO K91 SMART TV 55-INCH

It's not Google TV; it's an Internet-connected TV running Android 4.0 off a Snapdragon 8060 1.5GHz dual-core CPU.

4 55-INCH OLED TVS

After years of hearing how OLED technology is going to revolutionize displays, it's super exciting to know the technology has finally arrived on large, lustworthy screen sizes.

3 RAZER FIONA

A handheld gaming tablet with an Ivy Bridge processor that runs Windows and actually looks like it won't suck? Yes, please.

2 ASUS PADFONE

By giving you the computing guts inside a full-fledged Android phone that snaps into the tasty shell of a full-size tablet, the Padfone appeals to the efficiency expert in us all.

1 IEEE 802.11AC ROUTERS

Trendnet says its model TEW-811DR will deliver wireless speeds as high as 1.3Gb/s.

HEAD TO

BY MARKKUS ROVITO

Asus Zenbook vs. Asus Transformer Prime

Let's say you're looking for a portable computer. Like, really portable. Maybe even *ultra*portable. Well then, you may have your eye on one of the first ultrabooks to come out, the Asus Zenbook. But hold on. Asus also unveiled the first Tegra 3 quad-core Android tablet, the Transformer Prime, and gave it a keyboard dock option, making it all the more laptop-like. Could it be that the smaller, lighter, less expensive Transformer Prime package holds the answer to your mobile computing needs? Let's eye both Asus inventions objectively and suss it out.

Round 1: Portability

Notebooks don't come much more portable than the 13.3-inch Zenbook. The sleek aluminum laptop measures 12.75x8.75, with a thickness that ranges from 3mm at the closed front end to 9mm at the rear. At 3.1 pounds, it's not the lightest of ultrabooks, but when you slide it into its included carrying sleeve and drop it into your backpack, it feels like nothing compared to a conventional laptop. Even the compact AC adaptor was made with portability in mind.

It's quite surprising that the combined Transformer Prime and keyboard-dock pseudo laptop weighs 2.5 pounds—only a smidge less than the Zenbook. Dimensionally, of course, the Prime/dock combo comes in much smaller, at 10.4x7.1x 0.75 at its thickest point. When portability matters most, you can always detach the 1.29-pound Prime tablet and carry it solo.

Winner: Transformer Prime

Round 2: Capability

In the Transformer Prime, you have a reasonable, if nontraditional, substitute for a full-fledged laptop. It's loaded with the passable Polaris Office software for working on .doc, .xls, and .ppt files. It has HDMI out and MicroSD, and the dock adds a full QWERTY keyboard with shortcut keys, trackpad, a full SD card slot, and full-size USB 2.0, which supports mice and external drives. It even has some niceties you won't find on most laptops, like the multitouch screen and back panel video/still camera with preinstalled Movie Studio video editor.

On the other hand, the Zenbook is a full-fledged, if limited, laptop, with Windows 7 Home Premium, unfettered USB 2.0, USB 3.0, HDMI and VGA outputs, SD card reader, Ethernet capability (via an included adaptor), and gesture-supporting trackpad. The Prime's Android 4 OS is only going to get more powerful as quality apps are added, but the Zenbook's Windows 7 alone makes it the more capable beast, giving you full access to the possibilities of modern computing.

Winner: Zenbook

Round 3: Power/ Performance

Given the aforementioned limits to the Prime's capability, there aren't as many apples-to-apples comparisons of system performance as we'd like. The Zenbook has the edge in the numbers game, with memory and storage of 4GB and 128GB respectively, compared to 1GB and 32GB in the Prime. Zenbook's dual-core 1.7GHz i5 2557M chip probably packs more wallop than the quad-core 1.3GHz Tegra 3 inside the Prime, especially when you consider that from a practical standpoint there isn't much software optimized for Tegra 3 yet.

In side-by-side tests, the Prime has the prettier display, with deeper black levels. With the extra dock battery, it also has a much longer life, averaging 14-16 hours compared to 5-7 hours for the Zenbook. However, the Zenbook trounced the Prime in benchmark tests for JavaScript and HTML5 and felt more robust overall, especially when handling multiple processor-heavy jobs at once.

Winner: Zenbook

Round 4: Convenience

Perhaps a murky category, we're looking for the sweet spot where each machine's best qualities match up with its ability to meet your needs. On the Prime side, its small size and multitouch screen facilitate quick-and-easy web browsing, email or Twitter checking, and casual amusements such as games and watching videos. Like all tablets, it's a great nightstand, coffee table, or passenger seat machine, and it being one of the most powerful tablets just adds to your contentedness.

The fact that the Zenbook is less wieldy means it's capable but not always as convenient for all of the above tasks. But when you have a lot of those tasks to accomplish, the Zenbook unquestionably makes for the better choice. While Android tablets still trump the iPad on multitasking, the multitasking prowess of a real PC puts a 'droid like the Prime to shame. When you need to bounce back and forth between email, a Word doc, a browser, and, god forbid, some "real" software like Photoshop, you choose the most efficient OS.

Winner: Zenbook

HEAD

Our Asus Zenbook US31 config includes an Intel Core i5-2557M 1.7GHz CPU, 4GB DDR3, and a 128GB SSD.

With or without the optional keyboard dock, the Asus Transformer Prime holds its own with a quad-core Nvidia Tegra 3 chip.

Round 5: Value

Our Zenbook model commonly sells for $999-$1,099 online, and you have the option of spending more for a 256GB SSD and/or a Core i7-2677M. With the $149 keyboard dock, the Transformer Prime will lower your bottom line by about $650 (32GB) or $750 (64GB). It's a significant price difference, and you do get what you pay for in terms of overall utility. While the Prime is not the most affordable of tablets, it is one of the best, and the keyboard dock is a bargain for the value it adds.

Neither is the Zenbook the lowest-price ultrabook, but again, Asus delivers a solid deal when it comes to performance and aesthetics. If you're just looking for a clamshell that handles the basics of computing and media consumption in a mobile package, then the Prime is the more affordable package. But when it comes to evaluating what you get per dollar, we see it as even.

Winner: Tie

And the Winner Is…

In many homes, laptops have already replaced desktops. So the question is, when it comes to a computer you take outside the home, can a tablet like the Transformer Prime replace a laptop? In some cases, such as long weekends, no-work vacations, or lazy afternoons at a coffee shop, they certainly can. But for business trips, telecommuting, or any scenario where you need the full power of a PC system, you still need—you guessed it—a PC. If you're looking for one slim, light laptop to take with you, out of these two we have to recommend the **Zenbook.** While we gave the Prime a Kick Ass award in our March issue, it's still not ready for prime time as a laptop replacement. If we had to replace a laptop with a tablet, the Prime would be the one to get, but an ultrabook like the Zenbook still has more power, more capability, and much more software at the ready to be replaced by an Android device.

DOCTOR

THIS MONTH THE DOCTOR TACKLES...

>SSDs in RAID 1
>POST Depression
>SSD/HDD Voltages

SSDs in RAID 1

Here's a question that puzzles me and others in several forums. As you know, SSDs wear out over time and fail when they reach their write or read thresholds. If you were to take two identical SSDs and set them up in RAID 1 (mirror), then theoretically they will be read and written to at the same rate. Therefore, they will also fail at the same time.

So, is it worth it to use identical SSDs in RAID1? Do you lose the level of protection that a RAID 1 provides—which is that one drive will likely fail at a different time than the other?

Can you put this theory to the test? Take two brand-new identical SSDs and create a RAID1 set. Run intensive disk read and write operations nonstop, 24/7. Let's see if both fail at the same time.

—Nicholas Nicolaou

THE DOCTOR RESPONDS: The idea that two identical SSDs in RAID 1 (and therefore given the same exact inputs and outputs) will burn through their write cycles at the same time makes logical sense. Each NAND cell does have a limited number of write cycles—around 10,000 in the case of an MLC SSD. Modern SSDs use wear-leveling algorithms and overprovisioning to ensure that the cells all run through their write cycles at around the same rate. Once a cell has run through its write cycles, it doesn't "fail," per se, it just becomes read-only, so you should still be able to access the data on the drive.

RAID 1 makes some sense for mechanical drives, which have moving parts and thus higher failure rates than SSDs, and when they fail, you usually can't read or write to them. As a home user, you're not likely to run through your SSD's write cycles during its operational lifespan, and in any case, you should still be able to retrieve your data from the drive, even if all its cells "wear out." SSDs can fail in ways that don't involve running through their write cycles, so RAID 1 could still make sense if you're really paranoid, but if you're just worried about your drives "wearing out" due to write cycles, the Doc thinks it makes more sense to make regular backups on a mechanical drive instead, and avoid spending money on a superfluous SSD.

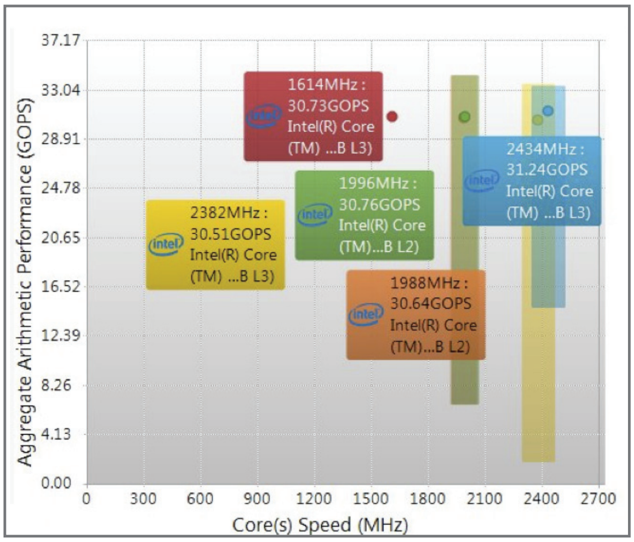
Super Instability

I built a brand-new system I call The Supercomputer. It has a Core i7-3930K, G. Skill Ripjawz-series quad-channel memory (32GB), dual Radeon HD 6950s, two Western Digital 2TB and two 1.5TB, Windows 7 ultimate 64-bit, a Blu-ray player, and an Asus Rampage IV Extreme motherboard. I am a huge gamer, and occasionally the system crashes on either Modern Warfare 3 or Skyrim. When it crashes, the whole computer freezes. I am very lost. I think it's the motherboard, but I'm not sure. What do you think?

—Jake Provenzano

THE DOCTOR RESPONDS: That is indeed a very sweet rig, but hard locks aren't good. Assuming you are overclocking, stop overclocking or back it down to a level that's more stable. Your crashing could come from many areas. The cheapest thing to check is your CPU cooler. Ensure that it is correctly installed, and that you didn't use too much or too little thermal paste. It's also common to neglect to install the cooler, so the chip may be overheating.

Download and run the memory diagnostic tool Memtest86+ from Memtest.org. Hopefully it works, as it's been updated for Sandy Bridge chips, but not Sandy Bridge-E. The Doc also notes that motherboards using the quick-release slots for RAM make it very easy not to fully



SiSoftware's popular Sandra 2012 utility includes many analysis, benchmarking, and diagnostic tools. A five-client Professional Home version runs $50.

↘ submit your questions to: doctor@maximumpc.com

insert the RAM in the slot. That can make the system unstable and can also lower performance. Check this by looking at the amount of RAM that Windows is reporting. Also download SiSoft Sandra from SiSoftware.net and run the memory bandwidth test. You should see from 35GB/s to 40GB/s of bandwidth, depending on what your RAM is set for. You also didn't say what kind of PSU you have, but low-quality power supplies are often at the root of problems on DIY systems. The Doc would probably also remove one of the GPUs from your system in the meantime until it stabilizes.

POST Haste

I have built my first computer using a lot of your recommendations. After running well for about a month, the PC has failed to POST. Do you have recommendations on testing tools to help find the real issue? Perhaps you could recommend the basics, as well as what would be good for those who don't mind spending extra dollars to get more advanced equipment.

—Mike Newcomb

THE DOCTOR RESPONDS: You didn't mention your configuration or if you were overclocking, but here are a few general tips to follow when your machine won't POST or turn on at all. Check the power cable that plugs into your PSU; it may have wiggled loose if you didn't insert it far enough initially. Check your power supply switch's on/off button, check the socket that the PC is plugged into to see if it's hot. If it's in a power strip, check the power switch to see if it has been turned off or tripped. Open your case and double-check the Main Power Connector that plugs in near the RAM, and the ATX12V/EPS12V connector (that 2x8 connector that plugs in near the CPU). The Doctor would also check the power switch on your PC. This may have backed off when you tinkered in the box or the actual switch may have failed. If your board has a power button mounted on the PCB, see if pressing that will fire it up. Obviously, if it works with this switch but not the switch on the PC, the latter switch might be bad.

If all of the connections are good, it's time to reset the CMOS on the board. There's usually a button or a pair of jumpers that will let you do this. If that doesn't do the trick, the most likely culprit is the PSU, if it's a lower-end model. Try to borrow or use a secondary PSU to see if the machine fires up. From there, consider reseating the motherboard and CPU.

Use Thy SSD

After a new install of Windows 7 on a 256GB SSD, what folders should be moved to the hard drive in order to keep the SSD read and write cycles to a minimum? I've searched the Internet and found bits and pieces of what should and shouldn't be moved, but I never found a complete list. I also found disagreement on whether or not a certain folder should or shouldn't be moved. After a few weeks of searching, I'm more confused than ever.

—Mike Kipper

THE DOCTOR RESPONDS: A 256GB drive is big enough that you don't need to be a miser with your space, as long as your documents aren't on it. The Doctor recommends setting your Libraries so that they default to folders on the mechanical drive, but leaving everything else as is. You could also use Steam Mover to keep only the games you're playing at the moment on your SSD and the rest on your mechanical.

You also shouldn't really worry about minimizing read and write cycles—you bought an SSD, so use it! It's the write cycles you need to worry about, anyway, and you're incredibly unlikely to run through all yours before you upgrade to a larger SSD. SSDs are useful because they're fast, and you won't get any benefit from that speed boost if you try not to use your SSD for anything.

Wireless Audio

I'm in the process of building an entertainment PC and would like to connect wirelessly to my stereo amp so that I can play music and TV sound through my main speakers. I have not been able to discover a transmit-and-receive system that can do this. Any recommendations?

—Charles Cobb

THE DOCTOR RESPONDS: Not knowing your particular setup, if all you're looking to do is stream stereo audio from your PC to your stereo without wires, Aperion Audio's Zona Home Audio Link ($150, www.aperionaudio.com)can connect to your PC's USB port and stream audio to a companion receiver plugged into your stereo system. If your PC has a TV tuner, it could stream TV audio to your stereo, too (although you'd still need a cable to send video to your TV). Multichannel audio is a whole different diagnosis. However, if you want to stream both audio and video to a receiver wirelessly, and all your equipment is outfitted with HDMI, a wireless HDMI device such as the Rocketfish WirelessHD ($600) kit will do the trick.

SSD/HDD Voltages

I've noticed that after using my notebook and tablet for the last year, my need for a large desktop PC is greatly reduced. So I've decide I'd like to build a home network of mini-boxes.

I'd like to use a combination of SSDs and notebook hard drives. However, I'm not sure if the voltages needed to run both SSDs and mini HDDs are available on low-wattage PSUs. I've looked at different online PC dealers, but not enough specs are listed. Am I looking to do the impossible?

—Lauren More

THE DOCTOR RESPONDS: That's not impossible at all. SSDs and notebook hard drives use the same 5V SATA power connectors as desktop hard drives, and indeed consume less power. You should be able to use them in any small form factor PC, though you may need to buy a 3.5-inch-to-2.5-inch drive bay converter if the chassis is a few years old.

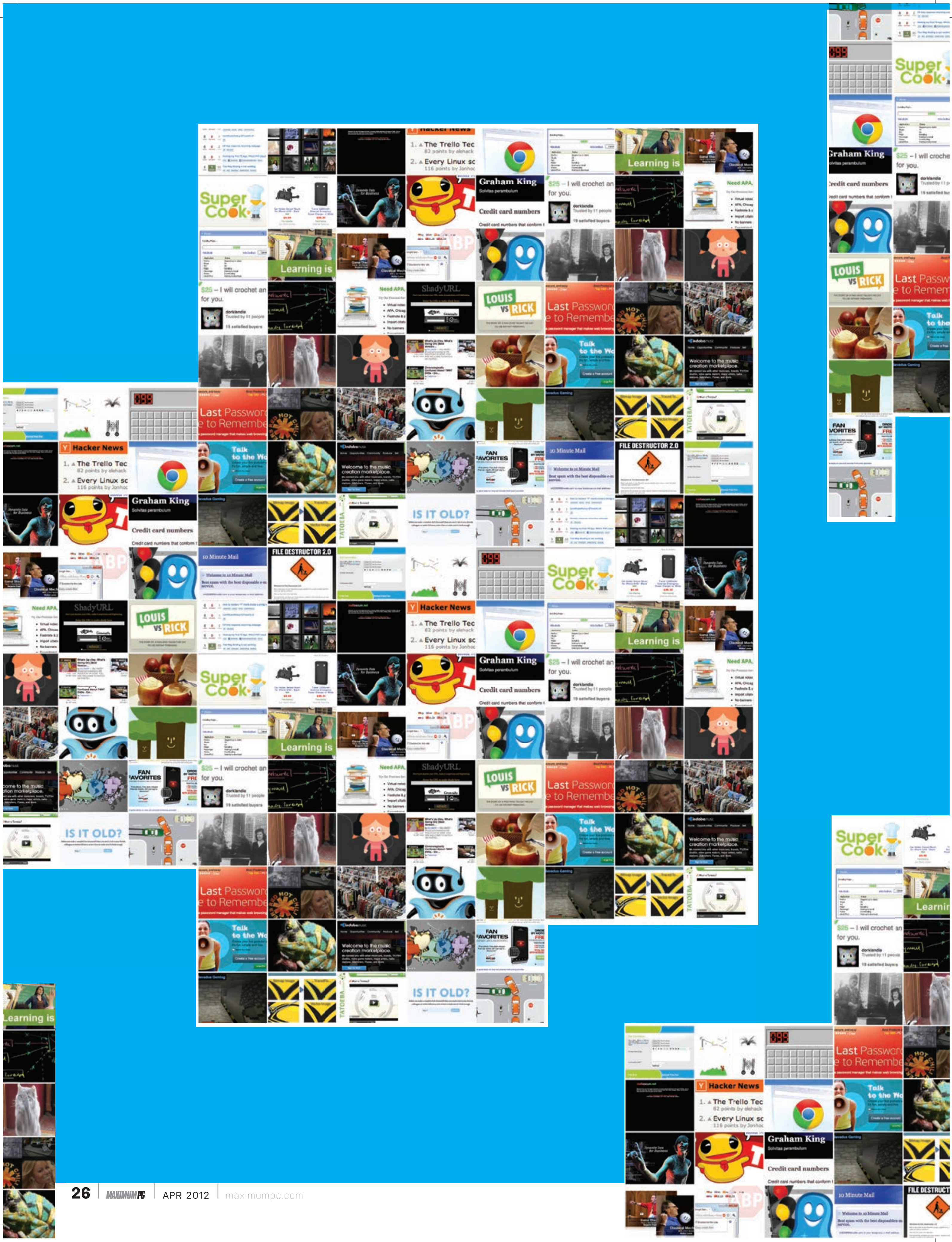
SSD Install Fail

I have tried, unsuccessfully, to install an 80GB Intel X-25 SSD into my Asus G73 laptop using the recovery discs. I have used the recovery discs prior to this SSD install attempt with the original HDD to remove a bad file (virus), and it worked just fine. When I install the SSD using a Windows 7 Ultimate 64-bit disc it works fine, but I like the drivers and features on the original image. When I try the backup discs with the SSD, it looks like everything is working fine, with the HDD activity light blinking, but after five DVDs and an hour of time to see if it has taken, all I get after rebooting is an error message: "No operating system found." I have reformatted the SSD with an NFTS filesystem prior to installing the SSD into the laptop, but the result is the same.

In frustration I installed it into my MacBook, and it works fine with Snow Leopard, but I really want to increase the performance of my Asus. I do not know why the recovery discs are not installing.

—John Neal

THE DOCTOR RESPONDS: John, the disc imaging process is likely failing because it's trying to replicate the original partition, which was sized for a 500GB (or larger) mechanical hard drive, onto an SSD that's much too small. You'll have to do a clean install, but you should be able to download the drivers and features you want from Asus's support website (support.asus.com).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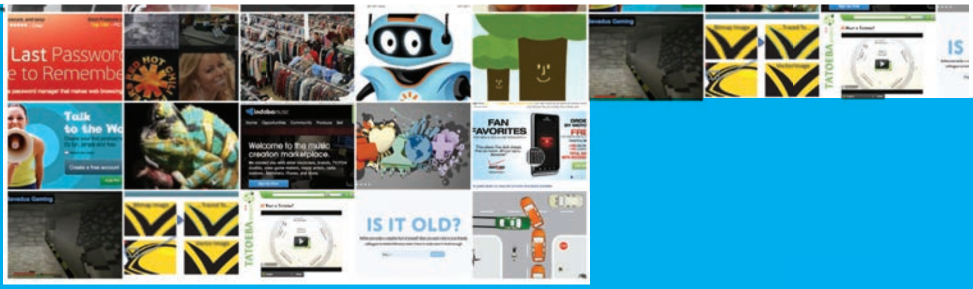
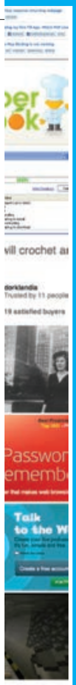
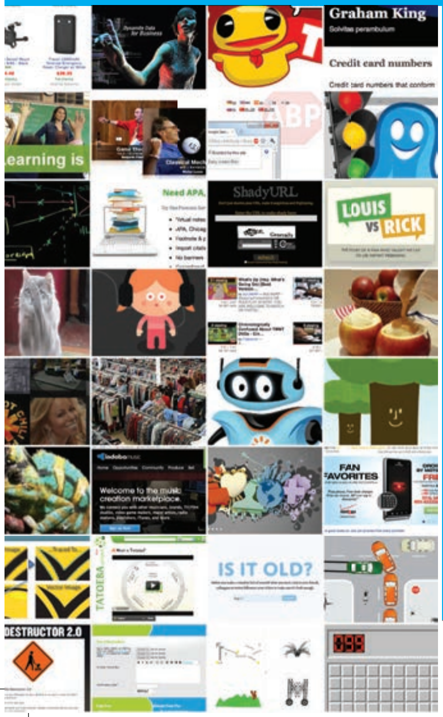




BY THE MAXIMUM PC STAFF

TRIPPING THE SITE FANTASTIC

73 INCREDIBLY AWESOME WEBSITES YOU NEED TO KNOW ABOUT



How big is the Internet, to you? No, we don't want to hear about all the billions of pages indexed by Google. We're talking about *your* Internet—the set of sites that you're aware of, that you might actually visit. If you're like most people, it's actually pretty small. Even if you spend a lot of time online, you're still missing out on tons of great content.

That's why we compile our annual list of websites. Not because we think that we've found the 73 *best* websites in the world, but because we know that the Internet is too huge for one person to explore by him- or herself, and that it is always growing. We do it because we know that everyone could use a yearly dose of fun, useful, and interesting new sites to add to their browsing repertoire. On the following pages we present 73 of our favorite new or unknown destinations on the Internet. Just don't blame us if you find you're spending more time than ever in front of your screen!

UTILITIES

LastPass

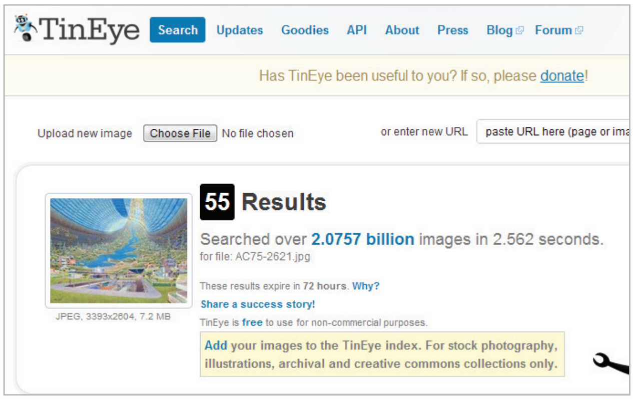
FORGET YOUR PASSWORDS, BE SAFER An easy-to-remember password is an insecure password, especially if you use the same passwords for everything. Use LastPass to generate and store ultra-secure, unique passwords for all your sites. With browser extensions and desktop and mobile versions available, you'll always be able to access your passwords, but thanks to LastPass's robust security auditing, strong master passwords, and optional two-factor authentication, bad guys won't.
www.lastpass.com

Dropbox Automator

EVEN MORE DROPBOXABILITY Dropbox is already a powerful tool, and Dropbox Automator makes it better. Pick a folder in your Dropbox, and then apply actions to it. Create a folder that automatically uploads every picture in it to Facebook, or converts documents to PDF or uploads them to Google Docs. Or email yourself every time a collaborator puts something into a shared folder. The sky's the limit.
dropboxautomator.wappwolf.com

If This Then That

LIKE SUPER GLUE FOR THE WEB What if you could automagically make things do other things? What, you need specifics? How about an app that emails you if it's going to rain tomorrow, or changes your Twitter avatar when you change your Facebook profile picture, or downloads photos you're tagged in to your Dropbox? If This Then That lets you choose from hundreds of recipes and lets you roll your own, as well. Make the web work smarter for you.
www.ifttt.com



TinEye

REVERSE IMAGE SEARCH If you're not sure of the source of a picture you see on the Internet, maybe TinEye can help. TinEye uses an image-interpreting algorithm and compares the picture to a database of more than 2 billion images on the web, so you can find out if the image you're about to upvote is sweet, sweet original content or just another repost.
www.tineye.com

PrintFriendly

WHEN YOU PREFER PAPER Not every website has a print-friendly style sheet available for those of us who want to read articles on deadtreeware. PrintFriendly lets you turn any URL into a, well, print-friendly version of itself that you can then either print or convert to PDF. It's smart, too—if the autoformatting doesn't get rid of an element you don't need, you can just click it in the preview window to delete it.
www.printfriendly.com

Dead Pixel Test

PICK A PECK OF PICKLED PIXELS Here's a test you should run as soon as you take that shiny new LCD monitor out of its box—and repeat at least weekly while it's under warranty. If your display has or develops a pixel defect, pointing your browser to this website will immediately expose it. Pick the color you wish to test, tap F11 to put your browser into full-screen mode, and study the screen for defects.
www.doihaveadeadpixel.com

File Destructor 2.0

NEED AN UNOFFICIAL EXTENSION? We're not ones to subvert the higher education system, but we recognize that every once in a while you get behind on an assignment and need an extra day. That's what the File Destructor is for—use it to generate a broken file, turn it in, then finish your assignment in the time it takes your professor to email you that something went wrong.
www.xnet.se/fd/

Can You Run It?

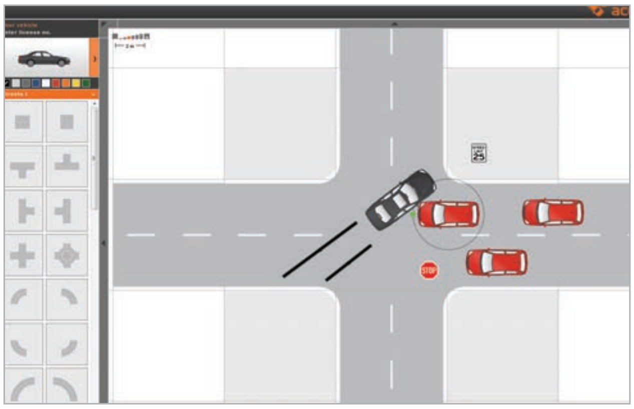
DOES YOUR PC MEET THE SPECS? We usually go by the rule that if you have to ask if your PC can run a certain game, you probably shouldn't bother. But that's the snob in us. Fortunately for everyone else, there's this site. Just pick any game, and a Java or ActiveX applet will analyze your PC to see if you meet the minimum specs or not. To feel even more insulted, hit the Recommended button.
www.systemrequirementslab.com

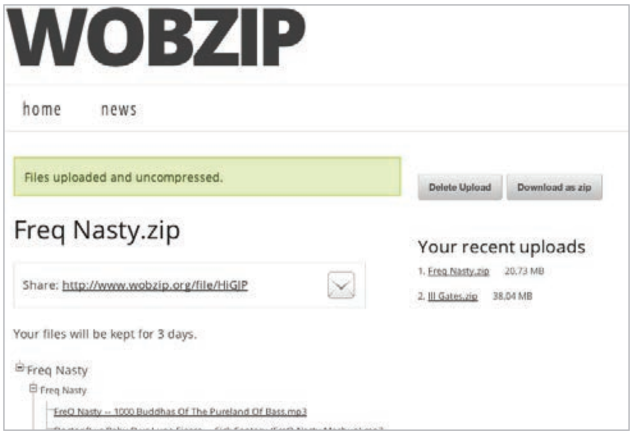
Accident Sketch

OOPS, I DID IT AGAIN Let's face it, the aftermath of even the most minor fender bender is a major headache. Accident Sketch provides a simple, one-stop resource to file claim paperwork and photos, but its coolest feature is the eponymous Accident Sketch feature. The surprisingly robust Flash app has a ton of options, meaning your days of rough sketches on the back of a folded up napkin are a thing of the past.
www.accidentsketch.com

Snaggy

BEHOLD THE POWER OF COPY AND PASTE If photo editing software just isn't your thing, but you want to quickly share some screenshots, Snaggy's got you covered. Snaggy cuts out the middleman entirely, letting you paste images directly from your clipboard to the website—you know, to save yourself those vital 20 seconds of pasting to Paint and saving locally.
www.snag.gy





Ge.tt

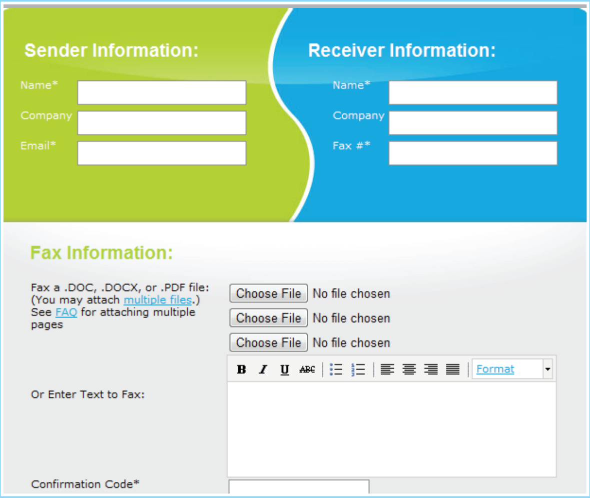
GE.TT IT? GOT IT? GOOD Calling Ge.tt a file-sharing service is selling it a bit short. This real-time media publishing site lets you upload and publish documents, images, music, and videos, and share them with your friends instantly via email, direct link, or your social network of choice. A 100 percent pure web app, Ge.tt is as tiny as it ge.tts—the URL is a mere five characters long, and works without the need of Flash or Java.
www.ge.tt

Wobzip

UNPACK FILES, FREE OF SOFTWARE We love software as a service, rather than a product. And a free service? Even better. Thank you, Wobzip, the one-stop site for uncompressing files (up to 100MB) online. Simply upload a packaged file, and when Wobzip is finished, you get links and a URL to the freed files that are good for three days. The site works with 30 file types, including ZIP, TAR, GZ, RAR, and ISO.
www.wobzip.org

Zamzar

CONVERT FILES ONLINE Prepare to uninstall your incomplete file-converter software. Zamzar lets you upload and convert files to dozens of image, doc, music, video, and e-book formats. Files up to 100MB are free. For larger file sizes (up to 1GB), simultaneous conversions, online storage, and other perks, you'll have to throw down a little dough.
www.zamzar.com



Fax Zero

YOUR BRIDGE TO THE PAST We can't tell you why some people require that you send documents to their ancient fax machines, but it does happen, and it's a pain. When you have to play ball with the technologically backward, use Fax Zero, which lets you send faxes from your computer for free.
www.faxzero.com

TripIt

MANAGE TRAVEL ITINERARIES Whether you trot the globe or just know people who do, TripIt works as a master hub for seeing who's going where and when. It rounds up all your travel reservations from multiple sites into one schedule, adding maps, directions, and weather for the voyage. Connect with friends to share plans or book restaurants and tickets within TripIt. Apps for Android, iOS, WP7, and Blackberry keep it convenient.
www.tripit.com

ENTERTAINMENT

Jet Punk

THE ONLY QUIZ SITE YOU'LL EVER NEED Movie quizzes, geography quizzes, '80s catchphrase quizzes, NFL quizzes, Fresh Prince lyrics quizzes… with new quizzes released every day. We like Countries of the World, which gives you 12 minutes to name all the countries you can. Quizzes range from fun and easy to fairly challenging.
www.jetpunk.com

Gifsound

MOVING PICTURES WITH SOUND? I SAY! If you've ever seen an animated .gif and thought, "That'd be so much better with sound," congratulations: You've just independently replicated the concept of video. It's not always the right time for a video clip, though; sometimes a .gif with sound is really what you need. Pair any .gif with the audio from a YouTube clip; share and enjoy. Sample: bit.ly/sTZgL7.
www.gifsound.com

Twitch TV

VIDEO GAME FUN, WITHOUT THE PLAYING PART For those who enjoy the voyeuristic, vicarious thrills of backseat gaming, we have TwitchTV. A spin-off of JustinTV, Twitch is all games all the time, from giant E-Sports event streams, to smaller enthusiast retro casts and everything in between. Yak it up with your buddies in the chat room as you check out a huge selection of channels, browsable by game and by caster.
www.twitch.tv

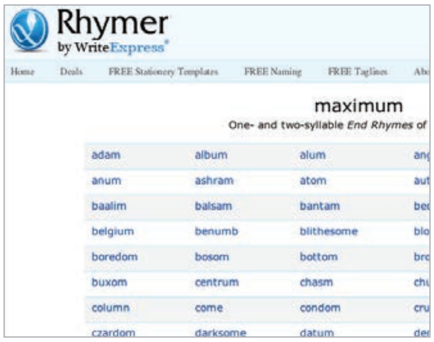
RunPee

WELL, GO AHEAD! RUN! PEE!
Runpee.com is equal parts hilarious and convenient. In addition to reviewing movies, the site editors make it their job to tell you at what point in any given movie you can run to the bathroom. According to Runpee.com, for example, 42 minutes into the film *Red Tails* is the best time to urinate, the cue being when a German fighter pilot says, "My god." They'll even tell you what you missed while you were gone!
www.runpee.com

REFERENCE

Rhymer.com

RAP LIKE BUSTA RHYMES IN NO TIME(S) This free online site displays rhymes for any proper English word you can think of. You'll also find links to dictionary definitions and a thesaurus. Need some rhymes for your end-times rap about the coming apocalypse? How about "hardships," "horsewhips," and "conscripts"?
www.rhymer.com



Howjsay.com

SAY WHAT? The brainchild of English language instructor Tim Bowyer, Howjsay is as simple as it is useful. Type in a word and Bowyer will pronounce it with impeccable diction. Howjsay also includes pronunciations for a handful of highbrow brands, so you can impress your date by ordering a glass of Courvoisier, Moët & Chandon, or Glenmorangie without sounding like a poseur.
www.howjsay.com

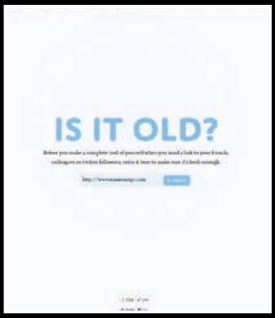
Debatepedia

MAKE UP YOUR MIND! Can't decide which side of an issue you should take? Debatepedia, produced by the International Debate Education Association, presents the pros and cons of thousands of topics in a wiki format. You'll find summaries of cogent arguments with links to the full online essays, op/eds, and articles.
debatepedia.idebate.org

AD

MASTERS IN COMMUNICATIONS

Tools to spruce up your IMs, tweets, or status updates



IS IT OLD?

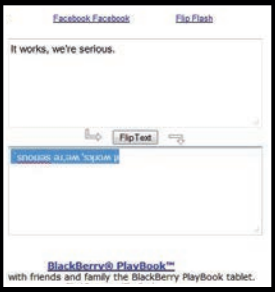
Nothing's more embarrassing than being called out on Twitter for your played-out YouTube link. This site's simple search checks Twitter for the frequency and age of a link and lets you know if it's the new hotness, or as played out as an arrow-in-the-knee joke.
www.isitold.com

MY FACE WHEN

There's a wide range of faces for a wide range of emotions, so sometimes emoticons just can't get the point across. This site has hundreds of gathered photos of celebrities, cartoon characters, and yes, even normal people making ridiculous faces, ready to hotlink. You'll never need an emoticon ever again.
www.myfacewhen.com

BIG ASS MESSAGE

If you've got a message you want to convey with conviction, this is the place to do it. Simply type your message into the box, choose the Style (including basic, magic, heart, and hypno), copy the url, and send that big-ass message to anyone you please.
www.bigassmessage.com



FLIPTEXT

Not a whole lot needs to be said about this website. You type in your text, it turns it upside down. It's a little too much fun using it to mess with your friends. All you have to do is copy the new text and paste it where you want it.
www.fliptext.net

SOCIAL AND SHARING

Hacker News

KNOW WHAT'S NEW IN TECH There are a lot of sites where you can read the news about technology, but if you want the insider perspective, this popular link aggregator for programmers, hackers, entrepreneurs, and venture capitalists is it.
news.ycombinator.com

PopURLS

WHO AGGREGATES THE AGGREGATORS? You're probably familiar with sites like Reddit and Digg, which aggregate popular, user-submitted content from all over the web. If visiting even that many pages is too much work for you, check out PopURLS, which collects the top posts from all the most popular sites on the web on a single page.
www.popurls.com

Synchtube

SHARE MEDIA WITH ROOMS OF FRIENDS One of the coolest features of Google+ is the ability to share with friends. Synchtube gets you that functionality without a Google account. You can organize into public or private rooms and share music and videos with your friends. Stream and share media from YouTube, Vimeo, Dailymotion, Blip.tv, Ustream, SoundCloud, Imgur, SlideShare, Livestream, and more.
www.synchtube.com

Pintrest

A PINBOARD OF PERSONAL INTERESTS Pintrest is half Google image search, half Tumblr, all gold. Users get a board where they can post images, videos, and links of everything from architecture to DIY, photography to science, gardening to fitness, etc. It's a wide net, and a great way to get inspiration or instructions on a project or just to explore a subject you already enjoy.
www.pintrest.com

Raptr

BE SOCIAL WHILE YOU GAME Raptr.com is a free web service that synchs to your day-to-day gaming life—whether that means tracking your gameplay hours, achievements, or just keeping up with your online pals. The front page serves as a sort of topic hub that features news and events planned within the Raptr community. A must-have for serious gamers.
www.raptr.com

Best of YouTube

THE NAME SAYS IT ALL This is an aggregator site for viral videos, compiling all the most popular videos from YouTube throughout the day. The videos can then be voted on, and the overall consensus is displayed right there in the player, before you even hit Play.
www.bestofyoutube.com

MUSIC & CREATIVITY

Indaba Music

CREATE MUSIC WITH AN ONLINE APP Whether you want to create music online in its Java Applet Mantis recording software, or get in on the site's many song and remix contests, the Indaba Music social community has become a ripe gathering place for aspiring musicians to gain exposure and valuable feedback. Free or paid members can upload and sell songs or submit music for contests bearing cash, royalties and other prizes.
www.indabamusic.com

Turntable

WHERE TUNES AND CARTOON AVATARS MIX A mashup of social networking, streaming music/radio stations, and TokiDoki-esque avatars, this site is designed primarily to get people listening to music together, in real time. Enter rooms where DJs spin tunes, vote on what's playing, and chat with other members. A good chunk of the rooms lean toward electronica, but there's enough variety to please most.
www.turntable.fm

WeVideo

EDIT, SHARE, AND STORE VIDEO Looking like a dead ringer for Final Cut, this free online video editor is a much more limited, but also more accessible, option—no downloads required. Upload your own media and use the provided audio, transitions, and effects. Monthly plans of various prices set different limits for your storage, video resolution, and video export time to YouTube and other social sites.
www.wevideo.com

This Is My Jam

SHARE THAT SPECIAL SONG Don't bombard your friends with every song you play. There are already services for that. Instead, if there's one song you're really rocking out to, you can share it here. This Is My Jam will find a YouTube video or an .mp3 and embed it, so when you announce to the world, "This is my jam!" they'll be able to jam along. If any of your Twitter or Facebook friends are on it, you're already invited.
www.thisismyjam.com

Pixlr

WHO NEEDS PHOTOSHOP? Looking to quickly edit an image on the go but don't have the time, money, or bandwidth to snag a fully featured photo editing suite? Not to worry. Pixlr is like an ant—it's tiny and lightweight, but also capable of some seriously impressive heavy lifting.
www.pixlr.com

Wordle

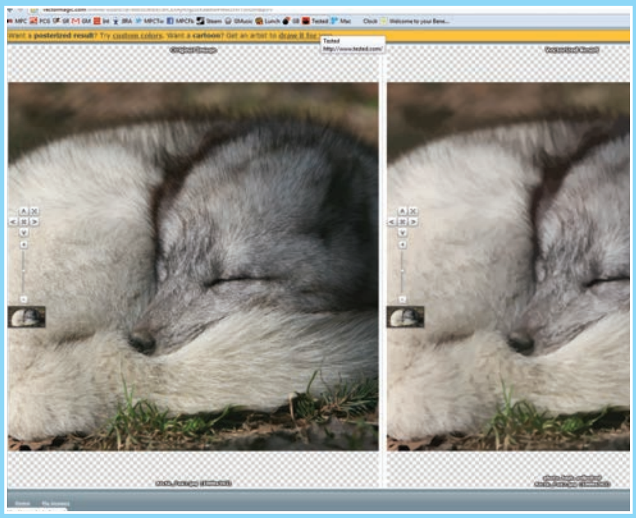
WHO DOESN'T LIKE WORD CLOUDS? Remember word clouds? Wordle takes text input—either a plaintext paste job or an RSS feed—and generates a cloud from the most frequently used words. The more often a word is used, the bigger it is. It's not a new concept, but Wordle's automatic cloud creation and its font, color, and layout flexibility, make it stand out.
www.wordle.net

Spreaker

BROADCAST AND ARCHIVE LIVE PODCASTS Stop wasting your know-it-all loud-mouthery on people within earshot. Spreaker blasts your voice live to the Interwebs using nothing more than your computer's built-in mic. A virtual mixing console can add music and sound FX. A free membership gives you 20 hours of audio storage, 30 minutes per show, easy iTunes and Zune syndication, etc. Monthly subscription plans step up your gab game.
www.spreaker.com

Vector Magic

WHAT'S OUR VECTOR, VICTOR? What with photo-editing being nearly ubiquitous these days, having easily resizable images is a must. Vector Magic takes your humble legacy image files and converts them into infinitely scalable vector graphics. Great for logos, line art, and cartoons, the Vector Magic tracing tool even gives photos a cool, watercolor filter–like makeover.
www.vectormagic.com



EDUCATION

OER Commons

PARTICIPATE IN AN EDUCATIONAL DEMOCRACY Short for Open Educational Resources, OER Commons is a clearinghouse of teaching and learning materials that are free for anyone to use, share, and contribute to. Composed of works from various universities, libraries, scholarly collections, and individuals, OER covers a wide range of subjects geared to a wide range of grade levels in an easily searchable database. It's a great tool for educators and self-learners alike.
www.oercommons.org

Academic Earth

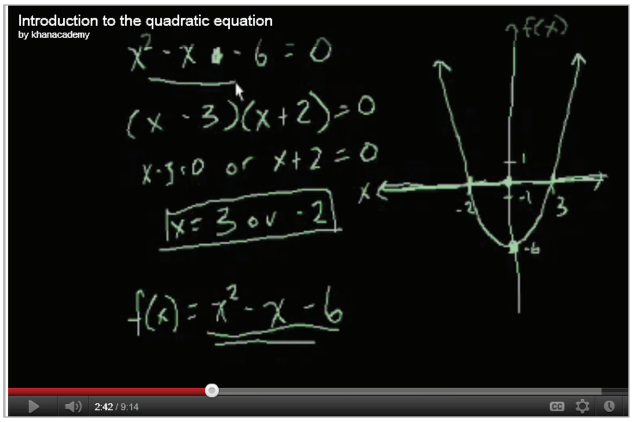
GET AN IVY LEAGUE ED FOR FREE You don't need to quit your job and move across the country to attend an elite university. You can sit in on video lectures and complete courses, some of which are for college credit, given at our nation's top schools—all from the comfort of your desktop. Search by subject, university, or instructor, or get started with Editor's Picks.
www.academicearth.org

Khan Academy

BECOME A MATH WHIZ Say you want to learn quadratic equations, or how to multiply polynomials, or even what a polynomial is—get to Khan Academy, where countless mathematical equations are explained and illustrated in clear detail on a virtual blackboard. In addition to the video lessons on math, science, and a number of other subjects, there are also practice exercises to help you put your new knowledge to use.
khanacademy.org

EasyBib

CITATIONS MADE SIMPLE After laboring over a research paper, the last thing you want do is carefully format a bibliography of the works cited. EasyBib handles this tedium for you. A vast searchable database gives you access to bibliographical info for books, newspapers, journals, and websites, and then formats your selections in one complete list, following MLA guidelines.
www.easybib.com



Super Cook

EVERY MEAL IS INDEED A BANQUET Pop quiz, hot shot: What can you make with a pork chop, sweet potato, and mayonnaise? Well, if you had just a little rosemary, you could make a nice balsamic-glazed pork chop. If you had a little onion, you could make Ed Zieba's Famous Family Pork Chops. Just take a quick inventory of what's in your pantry and fridge and enter them into Supercook.com for a quick recipe recommendation.
www.supercook.com

Tatoeba Project

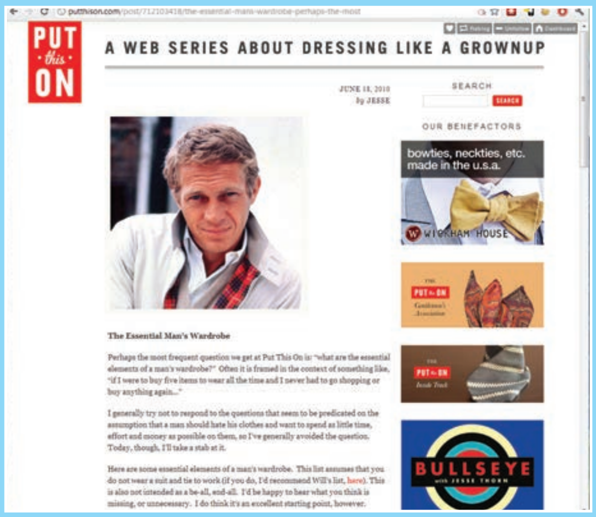
CURSE IN TURKISH Tatoeba is Japanese for "for example," and that sums up what the Tatoeba Project is all about. Tatoeba eschews a simple word-by-word library and instead has a searchable database of tons of example sentences from a wide variety of languages—many with voice clips. Now instead of just knowing random curse words, you can string together an entire grammatically correct epithet!
www.tatoeba.org

Codeacademy

FINALLY GET PAST 'HELLO WORLD' Want to learn code, but are too intimidated to delve solo into the dusty mire of instructional programming books? Thankfully, there's Codeacademy, a step-by-step interactive way to learn code. Codeacademy further incentivizes the learning process by giving out video game–esque "Achievements" for completing its easily manageable bite-size mini-lessons. Looks like the dog trainer was right—positive reinforcement works.
www.codeacademy.com

Stack Overflow

IT TAKES A VILLAGE TO WRITE AN APP Once you've gotten past the most basic steps on your journey to programming mastery, you'll start to run into bugs, challenges, and questions that you just can't figure out. No programmer is alone, thanks to great sites like Stack Overflow, which lets you ask a programming question and get quick answers from a community of experts.
www.stackoverflow.com



Put This On

TIME TO DITCH THE BLACK T-SHIRT AND CARGO PANTS? Put This On bills itself as "a web series about dressing like a grownup." Through a series of instructional/inspirational videos, how-to guides, Q&A sessions, and even sales notifications, host Jesse Thorn and his nattily dressed contributors will help you up your style quotient without turning into a total office-drab dweeb. Bow tie optional.
www.putthison.com

SECURITY

Eset Online Scanner

GET A SECOND OPINION ON MALWARE There's no such thing as anti-malware scanners that are capable of finding every evil on your machine, so we recommend doing an occasional secondary scan using another AV engine, such as ESET's Online Scanner. Just download the plugin, then once a week or month, after you've done your normal scans, task ESET with double-checking.
www.eset.com/us/online-scanner

Virus Total

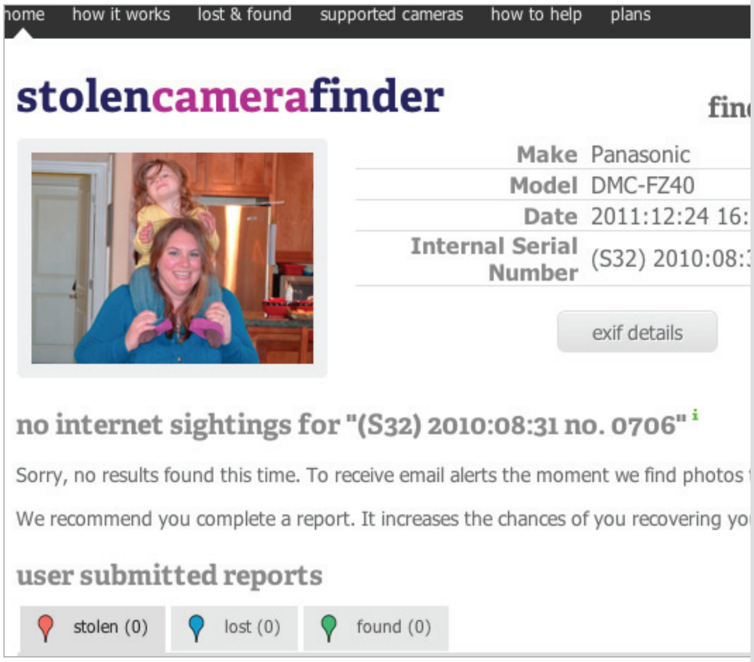
IS THAT FILE REALLY SAFE? Why get one second opinion on the safety of a file when you can get 42? That's what Virustotal.com does for you. Just upload a questionable file to the site, where a phalanx of antivirus engines will judge whether it's malware or not.
www.virustotal.com

Browser Check

CAN YOU HANDLE THE TRUTH? What's the leading attack vector these days on your machine? The hole-ridden plugins installed on your browser. Luckily, Browser Check has your back. This web-based scanner will check your browser's plugins for known security holes and give you links to patches (if any exist). Don't think you need it? We dare you to check—no, we double-dare you.
browsercheck.qualys.com

Adblock Plus

COMMERCIAL-FREE SURFING OK, it's not a website, per se, but the free browser extension Adblock Plus can improve the atmosphere of any website you visit by removing the ads. By default, ads are blocked on every site, but a button in your URL bar allows you to disable ad blocking at will. You can also create filters for any other offensive elements on the sites you visit.
www.adblockplus.com



Ghostery

TAKE CONTROL OF YOUR ONLINE PRIVACY It's true that our every move on the Internet is being monitored—usually with the intent of selling us something or selling information about us to someone else. Ghostery lets you "track the trackers." At every site you visit, a list appears telling you which entities are keeping tabs on you at that moment—learn more and selectively block unwelcome guests.
www.ghostery.com

Shady URL

THE PARENT TRAP On a purely humorous level, Shady URL lets you have fun turning innocent URLs into highly suspicious ones. But it's got a practical application, too. Send a Shady URL to someone you suspect of being careless about links—we're looking at you, Mom and Dad—and see if they open it. Then give them a stern talking-to.
www.shadyurl.com

Stolen Camera Finder

HEY, THAT'S MINE! Many modern digital cameras include the camera's serial number in the Exif data stored inside each photo. Stolen Camera Finder crawls the Internet searching for digital photos and collecting the serial numbers of the cameras that took them. If your camera is stolen, you can use the site to extract the camera's serial number from a photo (or enter the serial number manually) and search its database for a match.
www.stolencamerafinder.com

10 Minute Mail

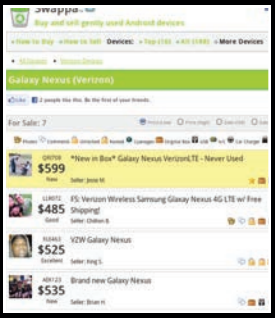
TEMPORARY EMAIL ADDRESSES A lot of sites these days offer perks for users who sign up for an account, and that frequently requires a verified email address. If you don't feel like sharing your email address with everyone on the Internet who asks for it, you'll need to use a site like 10 Minute Email, which makes it incredibly easy to create a temporary email address you can use to bypass verification.
www.10minutemail.com

SMARTPHONES, SMART BUYS

These sites will make sure you get a good deal on a smartphone

WIREFLY

Most cell phone love affairs end long before the contracts expire, so why pay through the nose for a fling you know won't last? Wirefly, one of the largest online cell phone retailers in the country, offers great prices on phones and service plans with every major carrier—except AT&T.
www.wirefly.com



SWAPPA

You got a fever. And the only cure is a new Android! Sell your old handset and find your new addiction all at one site. There's no listing fee; Swappa takes a flat $10 cut when the phone sells, and you'll be dinged with Paypal fees, as well. But it's still faster, cheaper, and probably less shady than Ebay. Paypal's buyer and seller protection plans have your back.
www.swappa.com

GAZELLE

Gazelle is the online equivalent of *American Pickers*. But instead of waiting for two guys in a van to roll up in front of your house, you describe the item you wish to sell and Gazelle will offer a price based on its condition. If you think the price is fair, they'll send you prepaid shipping materials and cut you a check after they receive the item. If they can't pay you for the product, they'll offer to recycle it (but you'll pay for shipping).
www.gazelle.com

COMMERCE

Topatoco

BUY STUFF FROM YOUR FAVORITE WEB ARTISTS Web artists make our lives better by publishing their work on the web for free. You can make sure your favorite artist has food, shelter, online access, ink, paper, and other necessities of life by shopping at Topatoco; buy T-shirts, books, coffee cups, and lots of other art-emblazoned goodies.
www.topatoco.com

Dynamite Deals

COMPARISON SHOP WITH EASE You can't track the inventory of hundreds of ecommerce sites at once, but Dynamitedeals.com can. This web plugin for Firefox and Chrome lets you instantly see the price of an item on other sites. For example, while browsing a camera at one store, Dynamite Deals let us know that the same camera was available elsewhere for $50 less.
www.dynamitedeals.com

Deal Extreme

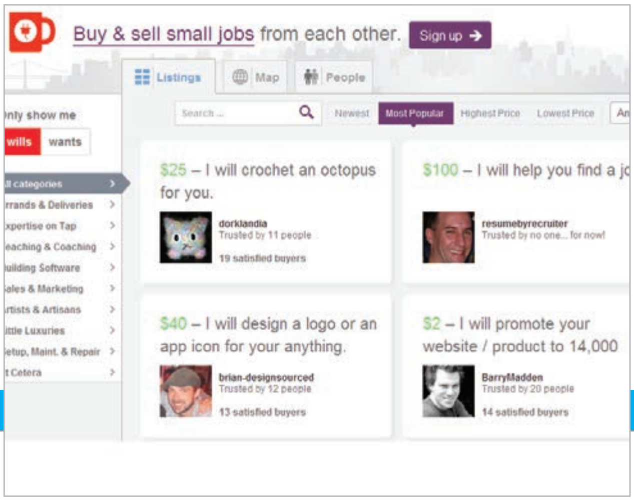
LIKE CHINATOWN, BUT WITHOUT THE HAGGLING Like all nerds, sometimes we'll take crazy-good deals over quality and customer service. That's Dealextreme.com in a nutshell. This site is a virtual flea market and Chinatown store rolled into one. Where else could you find everything from flashlight parts to cell phone parts to USB cables for dirt cheap? Sure, some of the parts may be knockoffs, and good luck with the documentation, but we guarantee that you can't spend fewer than 10 minutes browsing for stuff you don't need but might buy anyway.
www.dealextreme.com

Camel Camel Camel

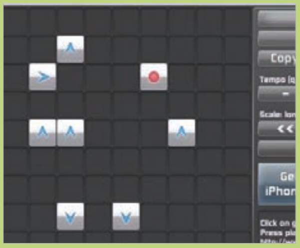
THE CAMEL WILL TELL YOU IF IT'S TIME TO BUY Are you sure that you're getting the best deal on the gizmo you've been salivating over? Point your browser at this site to see historical data on the price. The site tracks prices of products at Amazon, Best Buy, Newegg, and Backcountry.com so you can see if now is truly the time to buy, say, that Canon EOS 7D. We say yes, as the Camel tells us that camera is currently sitting at its lowest price since its introduction.
www.camelcamelcamel.com

Coffee and Power

SELL YOUR SKILLS If the weak economy has you feeling pinched, consider selling your services in small increments on Coffee and Power, an online marketplace of odd jobs. And some jobs are odd indeed—a crocheted octopus, anyone?—but many are very practical. Posts consist of both services for sale as well as small jobs in need of a provider. Presumably, somewhere in the mix, money is being made.
www.coffeeandpower.com



JUST FOR FUN



Otomata

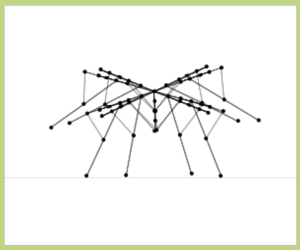
MUSIC SEQUENCING AS PING PONG Otomata is a generative sequencer that uses cellular automaton-type logic in the form of sequenced cells functioning independently of one another in their respective internal states. Oh, you want it in English? It's a music generator, which allows you to use a very interesting interface to change the pitch, tempo, and keys to create and record your own music. We warn you: Hours can be lost.

www.earslap.com/projectslab/otomata

Google Gravity

AN HTML5–FUELED PRANK For a bit of senseless fun, Google Gravity is equally fun to use and show to people. It's Google, but with no gravity, and each of the buttons, including the search bar, can be dragged around the screen. You can even use the search bar as a baseball bat and knock the other buttons all around the webpage. Fun stuff.

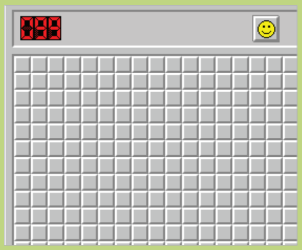
bit.ly/cDmYop



Sodaplay

GAMES FOR ENGINEERS AND ENGINEERS AT HEART If you thought playing with Lego bricks was an exercise in engineering, you ain't seen nothing yet. Sodaplay features a variety of applets that are as much physics simulators as games. If you think you've got what it takes, go to Sodaplay.com and get building.

www.sodaplay.com



Minesweeper Online

TAKE THAT, IT DEPARTMENT If you work in the kind of criminally un-fun office that removes even the built-in Windows games from your work computer, there's hope for you yet. The classic timewaster Minesweeper is available in all its grid-based glory online, as a simple web app.

www.minesweeperonline.com

Mafia Scum

TEST YOUR POWERS OF PERSUASION If you've been to a nerd gathering in the last few years, you've probably played Mafia—a social-engineering game of deception and deduction. It's a lot of fun for a group of eight or more people, and you can find tons of rules and variations, and even play online at Mafiascum.net.

www.mafiascum.net

Louis vs. Rick

MAN TEACHES CAT TO IM. HILARITY ENSUES Louis is a cat. Rick is his human. Rick teaches Louis how to use instant messenger, and thus is born a site dedicated to the IM conversations of a man and his cat. Written by Shane Cyr of the Selected Works, Selected Jerks podcast, LvR takes a hilarious look at Hannukah, cat territories, Caps Lock, litterboxes, house guests, and laser pointers from Louis's perspective. Funnier than most conversations (human or feline).

www.louisvsrick.com

My Parents Were Awesome

YOUR FOLKS, BEFORE THEY WERE OLDS Hard to believe, but at one point Pops was rolling around town on a motorcycle, and Mom was super fond of hot pants. A sepia-toned homage to the days before you got here, this site is a tribute to spandex, '80s hair, horn-rimmed glasses, fringed vests—and more than a little about giving a shout out to family.

myparentswereawesome.tumblr.com

Procatinator

CAT VIDEO + POPULAR SONG = GOOD TIMES They say that cats rule the Internet. So what better way to take over the universe than to take .gifs of cats, set them to popular but somehow thematically related music, and start a website with a punny name? Procatinator will in fact ruin all attempts you make at doing anything useful, but will also endlessly entertain you with mashups of a tabby cat punching the screen to *Eye of the Tiger*.

www.procatinator.com

intel®
Sandy Bridge-E

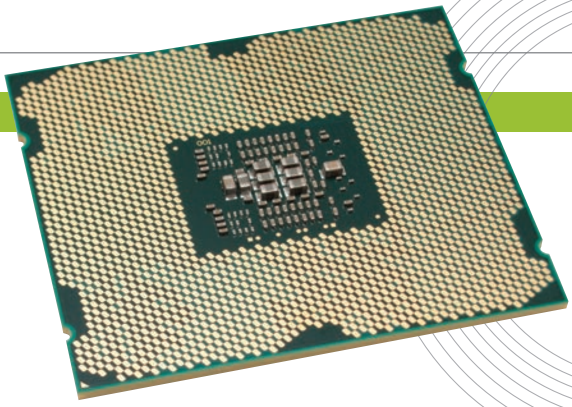
By Gordon Mah Ung

MEET INTEL'S CORE I7-3820

IS THIS NEW BUDGET SANDY BRIDGE-E A CORE I7-2600 KILLER?

THERE'S PROBABLY no better time than now to be a PC enthusiast. On the AMD side, users can choose between two eight-core Bulldozers at bargain prices. Even better, a new set of patches promises to give AMD's much maligned top-end chip a "free" performance boost. On the Intel side of the aisle, you're forced to pick between two different sockets—LGA1155 and LGA2011—but at least both of them are young with plenty of life still ahead. The only problem with LGA2011 has been the lack of a budget chip, something to keep the socket from turning into an elitist club. Well, not anymore. Intel has finally released the long-awaited quad-core budget chip for LGA2011. Using a new smaller die, Intel is giving enthusiasts a part that could actually give the popular, populist Core i7-2600K a run for its money.

To find out if Intel's new Core i7-3820 is a 2600K killer and worth skipping LGA1155 for—and whether AMD's Bulldozer really sees new life from OS updates—read on.



THE CORE I7-920 OF LGA2011?

There's no doubt that the hottest enthusiast CPUs to have today are Intel's Sandy Bridge-E series. They're fast and feature-packed—and they're freaking expensive, too. The top-end 3.3GHz Core i7-3960X costs a wallet-busting $1,000. One rung down, the 3.2GHz Core i7-3930K is cheaper but still more than $600 on the street. Most folks don't have that kind of scratch. So what's an enthusiast of modest means to do if he or she wants to step into an LGA2011 board with some sweet quad-channel RAM and tons o' PCIe lanes?

Problem, meet Solved. Intel's new 3.6GHz Core i7-3820 now gives enthusiasts on a budget an entry-level-priced way into the land of LGA2011. It's essentially the Core i7-920 of the LGA2011 platform. The 3.6GHz Core i7-3820 may be a Sandy Bridge-E chip, but it's markedly different from its pricier siblings. The most notable difference is the core count, as the Core i7-3820 is a native quad-core chip using a new, smaller die than the flagship Sandy Bridge-E. This reduction in cores greatly helps reduce the price. Those hexa-core chips, remember, are actually eight-core dies with two cores disabled for both technical and marketing reasons. With eight cores aboard plus boatloads of cache, those hexa-core Sandy Bridge-E chips are gigantic in size, which lowers yields and contributes to the cost.

You don't just lose cores, though. The Core i7-3820 also backs the cache down to 10MB from 15MB on the top-end Core i7-3960X. And it features 1 billion fewer transistors, but don't get hung up on that. First, high transistor counts don't necessarily equate to performance. Second, the Core i7-3820 is no slouch in the transistor-count game. Despite being a quad-core, it actually packs far more transistors than standard Sandy Bridge chips such as the Core i7-2600K. It even has more transistors than AMD's octo-core FX-8150 chip—as we learned when AMD embarrassingly had to restate the chip's transistor count from 2 billion to 1.2 billion.

In all other respects, we're told, the Core i7-3820 is the same as its bigger siblings. It has the same 40 PCIe 3.0 lanes, AVX and AES instructions, and quad-channel memory controller of the big boys. What it doesn't have is the pricing. At $285 in volume, the chip is pretty darn cheap. Hell, it's even cheaper than the two top Sandy Bridge CPUs: the Core i7-2600K and Core i7-2700K, at $317 and $332, respectively. And that's where the battle is right now for performance enthusiasts. Sure, people absolutely love the $1,000 Core i7-3960X, but the vast majority of power users are eyeing $300 CPUs for their systems. Obviously, this sets the stage for a high-noon-style shootout between the Core i7-2600K (a better deal than the Core i7-2700K) and the Core i7-3820.

THE PLATFORM MATTERS

It's not just about the CPU. Since the Core i7-2600K is an LGA1155 chip and the Core i7-3820 is an LGA2011 chip, each is incompatible with the other's motherboard. Once you've picked your chip, you pretty much buy into the infrastructure around it, which takes

CPUs COMPARED

	Intel Core i7-2600K	Intel Core i7-2700K	Intel Core i7-3820	Intel Core i7-3930K	Intel Core i7-3960X	AMD FX-8150
Code Name	Sandy Bridge	Sandy Bridge	Sandy Bridge-E	Sandy Bridge-E	Sandy Bridge-E	Bulldozer
Clock	3.46GHz	3.5GHz	3.6GHz	3.2GHz	3.3GHz	3.6GHz
Turbo Clock (max)	3.8GHz	3.9GHz	3.9GHz	3.8GHz	3.9GHz	3.9GHz (4.2GHz)
TDP	95 watts	95 watts	130 watts	130 watts	130 watts	125 watts
Cores /Threads	4/8	4/8	4/8	6/12	6/12	8
Volume Pricing	$317	$332	$285	$555	$990	$245
Process	32nm	32nm	32nm	32nm	32nm	32nm
Total L2 Cache	1MB	1MB	1MB	1.5MB	1.5MB	8MB
Total L3 Cache	8MB	8MB	10MB	12MB	15MB	8MB
Die Size	216mm²	216mm²	293mm²	435mm²	435mm²	315mm²
Transistor Count	995 million	995 million	1.27 billion	2.27 billion	2.27 billion	1.2 billion
Socket	LGA1155	LGA1155	LGA2011	LGA22011	LGA22011	Socket AM3+
Memory Controller	Dual-channel DDR3/1333	Dual-channel DDR3/1333	Quad-channel DDR3/1600	Quad-channel DDR3/1600	Quad-channel DDR3/1600	Dual-channel DDR3/1866

you down different upgrade and build paths. Obviously, there's a price premium for selecting the LGA2011 route and Core i7-3820.

To see how much of a price difference there is between the two, we configured two theoretical enthusiast PCs. As performance rigs, each is configured with the top-end Radeon HD 7970 card, an 850 watt Corsair PSU, a 128GB Samsung SSD, a 2TB Seagate hard drive, and an LG Blu-ray combo drive. For our comparison, we opted for Windows 7 Professional because Windows 7 Home Premium has an artificial maximum memory limit of 16GB, which can easily be hit given the low price of RAM today.

Between the two rigs, the only different parts are the CPU, motherboard, and RAM. Why RAM? The quad-channel configuration of the Core i7-3820 needs to be fed four DIMMs for maximum memory bandwidth, while the Core i7-2600K will give you the maximum memory performance with just two DIMMs. For our theoretical build, we found 8GB memory kits using two 4GB DDR3/1600 modules for $34. A kit of four 2GB DDR3/1600 DIMMs from the same memory company fetched about $50. It's a price premium, but not enough to break the bank. And once we get to 16GB, it's essentially a tie using 4GB DIMMs. We should also note that 8GB DIMMs have recently tumbled in price, so you could build a 32GB machine using four 8GB DIMMS for about $324 on a Core i7-2600K. That's not bad, considering that it was $900 just a few months before. The advantage still goes to the Core i7-3820, which can get to 32GB of RAM using eight 4GB DIMMs for $180. Of course, 64GB can only be done on a board with eight slots.

Moving on to motherboards, the Core i7-2600K has the upper hand. For our theoretical builds, we tapped midrange Asus boards for both. The mature LGA1155 socket for the Core i7-2600K gives you very good choices, with a decent midrange Z68 board going for $179 and budget boards below $100. In X79 land, boards are still priced at a premium. The cheapest board we could find was more than $200, and decent midrange boards were sitting around $330.

When everything is totaled up, however, the price difference between the two builds isn't that bad when you're building a higher-end system. Our Core i7-2600K rig came in at $1,880. With almost the same components on a Core i7-3820, we would have spent another $131. That's really not as pricey as we would have expected.

BUILD VS. BUILD

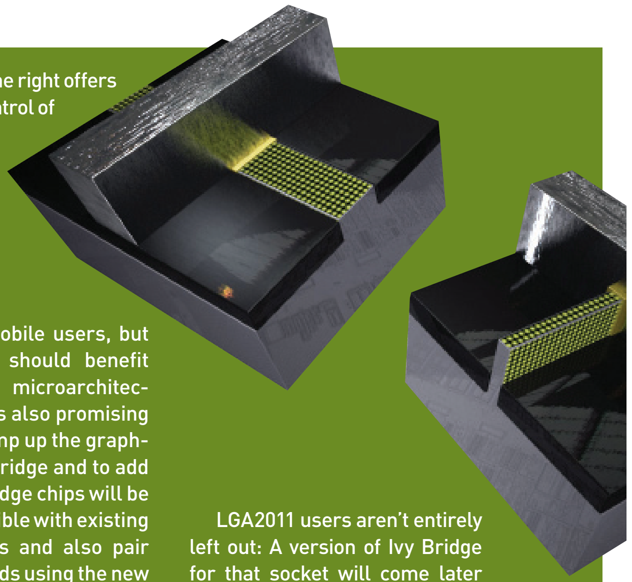
	Core I7-2600K	Core i7-3820
CPU	$319	$300
Cooler	$30	$30
Radeon HD 7970	$550	$550
16GB RAM DDR3/1600 (4x 4GB)	$94	$94
Midrange Motherboard	$179	$329
2TB HDD	$200	$200
128GB SSD	$175	$175
Blu-ray Combo ODD	$60	$60
850-Watt PSU	$134	$134
OS	$139	$139
Total	$1,880	$2,011

Which is cheaper? We configured two nearly identical machines with Sandy Bridge and Sandy Bridge-E chips to see how much of a premium you pay to ride the Sandy Bridge-E train.

It's not just strictly about prices. The Core i7-3820 gives you capabilities that the Core i7-2600K can't touch. The most notable is the availability of twice as many DIMMs. This gives you flexibility in how you configure your system's RAM. The quad-channel RAM also gives you roughly twice the memory bandwidth. Core i7-3820 has a leg up with its PCIe 3.0 support, too. PCIe 3.0 essentially doubles the bandwidth in PCIe 3.0 devices. Most people—including us—are inclined to pooh-pooh the value of doubling the PCIe bandwidth, since few devices actually swamp PCIe 2.0, but apparently it helps. AMD, for example, has said that simply switching a board from PCIe 2.0

NEXT-GEN INTEL CHIP TO FEATURE 3D TRANSISTORS

The tri-gate, "3D" transistor on the right offers more surface area and better control of leakage and power management than the standard flat, planar transistor on the left.



IF YOU'RE READY to jump aboard LGA2011 with a new Core i7-3820, Intel's upcoming Ivy Bridge CPUs might give you a bit of a pause.

Ivy Bridge chips will be the first CPUs based on Intel's new 22nm process using tri-gate transistors, which are literally 3D. Traditional transistors that limit and control the flow of electricity in a CPU are built in a two-dimensional fashion with the flow looking very much like a thin river with a gate laid across it to control the current. With tri-gate architecture, the "river" builds straight up like a fin. Instead of the electricity running on only one plane, it now runs on both the sides and the top of that fin. This increases the surface area, and theoretically enhances the control of leakage and permits more flow through the 3D gate. Ivy Bridge chips could offer far more performance while using far less power. That's a more compelling message for mobile users, but desktop users should benefit from enhanced microarchitecture, too. Intel is also promising to seriously pump up the graphics core in Ivy Bridge and to add PCIe 3.0. Ivy Bridge chips will be drop-in compatible with existing LGA1155 boards and also pair nicely with boards using the new Z77 chipset, which finally brings USB 3.0 to the table.

LGA2011 users aren't entirely left out: A version of Ivy Bridge for that socket will come later this year, as well, and will be dubbed Ivy Bridge-E.

to PCIe 3.0 boosts performance from 5 to 10 percent on its Radeon HD 7970 cards. LGA1155 boards will get their own PCIe 3.0 upgrade, but that won't come about until Ivy Bridge is available (see our sidebar on page 44) and will require buying a new CPU, since the PCIe is controlled from the CPU on Sandy Bridge and Sandy Bridge-E.

THE OVERVIEW ON OVERCLOCKING

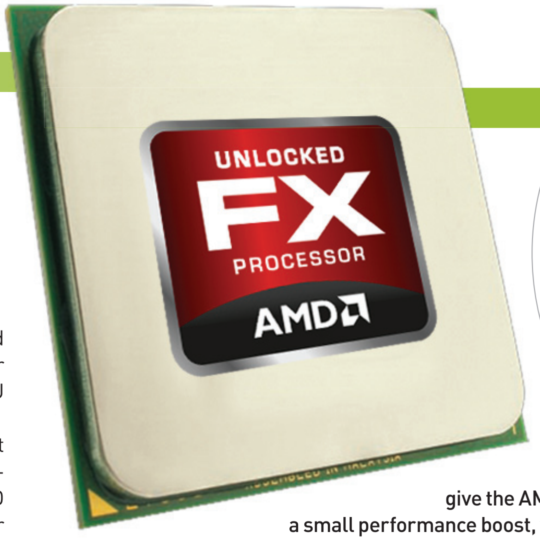
For overclockers, Intel is taking an odd track with the Sandy Bridge-E chips. Its two hexa-core chips are classified as K and X parts, respectively, which means they're fully unlocked chips that let you change Turbo Boost or clock multipliers at will. The new Core i7-3820 carries no such designation, but Intel says the chip is "partially unlocked." Similar to standard Sandy Bridge chips, it features limited overclocking, using Turbo Boost of up to four bins on all cores. That lets you take the chip to 4GHz. To get further, you'll have to rely on new block ratios of 125, 166 and 250. Overclocking won't be quite as straightforward or easy as on a Core i7-2600K, which can be pushed beyond 4GHz without blinking, but at least it's possible.

MAKING THE BIG DECISION

What we would pick depends very much on what we want to do with our system today and tomorrow. A box on LGA1155 definitely gives you a cost advantage that can be used to put in a bigger GPU or fatter storage. LGA1155 also lets you scale up from sub-$100 Celerons to the cheap-and-fast $200 Core i5-2500K and then on to a Core i7-2700K. LGA1155 also isn't a dead-end, with chips for it using the new 22nm Ivy Bridge on tap for this spring or summer. Where LGA2011 takes over is in the higher-end enthusiast segment. Folks who want and need the ability to run six cores will want LGA2011. It's also the better platform for anyone who needs a ton of PCIe 3.0 lanes to feed fast RAID arrays and GPUs. LGA2011 is also the better option for anyone who actually needs a ton of RAM. How does Core i7-3820 fit in the picture? It lets you build into a box that will take you higher up on the power curve than an LGA1155 system will take you.

DO-OVER FOR AMD FX

New Microsoft patch corrects scheduler issues and speeds up AMD's Bulldozer



Two new patches give the AMD FX chip a small performance boost, with more to come when Windows 8 ships.

Instead of bulldozing over Intel's CPUs, AMD's FX seemingly plodded along about as fast as its code-name next to an Indy car. OK, Bulldozer chips haven't been *that* slow, not by a long shot, but the reception the CPU has seen from the press and AMD customers makes it seem that way.

There was always one caveat with Bulldozer benchmarks that made us wonder if the OS was partially to blame for the chip's performance: Before samples of the chip ever hit the streets, AMD officials warned that Windows 7's scheduler wasn't optimized for AMD's new and unique dual-core modules.

AMD, in fact, has long said that it would take Windows 8 for the full performance of Bulldozer to be realized. Until then, there is at least some relief for the beleaguered chip. Microsoft recently released two patches designed to address the scheduler issue. The problem appears to stem from how Windows 7 deals with the core "parking" in FX chips. Core parking essentially puts unused cores to sleep to save power, but the Windows 7 scheduler was apparently putting cores to sleep that it could have assigned workloads to. Even worse, the Windows 7 scheduler would then wake up the cores it didn't use, which can cause performance to take a hit.

The additional performance from the two patches won't be as good as running Windows 8, AMD says, but it's still free. For the record, AMD says its testing has shown a 10 percent bump in Bulldozer performance in Windows 8 when compared to the same benchmarks in Windows 7. Applying the patches to Windows 7 gets you a roughly 1–2 percent increase over the pre-patched Windows 7, the company says.

The first patch, support.microsoft.com/kb/2645594, prevents Windows 7 from shutting down used cores prematurely and parking them when there are threads to be assigned. AMD says this helps reduce a performance penalty that comes from parking and unparking cores.

The second patch, support.microsoft.com/kb/2646060, updates the Windows 7 scheduler to be aware of all the modules used in the chip and will throw the first four threads at each of the four separate modules instead of loading two modules (four cores) with the four threads. Remember that Bulldozer's modules are made up of two cores that share resources. When a core is working on but one thread, it's being the most efficient. If you have two dual-core modules, for four cores, it would be the most efficient if two threads each ran on separate modules rather than both threads running on one module's two cores.

Oddly, we thought that Bulldozer might actually see more performance by placing more work on the same module, shutting down the other modules and then boosting the cores' clock speed, but apparently the best way to load them is to spread the work out among all the modules.

Be that as it may, we decided to retest the same FX-8150 chip that we tested in our Holiday 2011 issue. In addition to installing the two patches, we also updated the BIOS on the Asus Crosshair V Formula board. We then re-ran all of the previous benchmarks. Does the Bulldozer patch pump up the benchmark results? Well, if AMD is already saying its internal tests show just a 1-2 percent bump, we're not expecting to be blown away.

The final word on Bulldozer's performance may not actually be written until Windows 8 is released.

BRING ON THE BENCHMARKS!

We pass judgment on the patched FX-8150 and Core i7-3820

For our CPU showdown, we pretty much used the exact same hardware that we used in our Holiday 2011 CPU showdown. The AMD tests were run on an Asus Crosshair V Formula board, the Core i7-2600K on a Gigabyte GA-Z68X-UD3H-B3, and the LGA2011 part on an Asus P8X70 Deluxe.

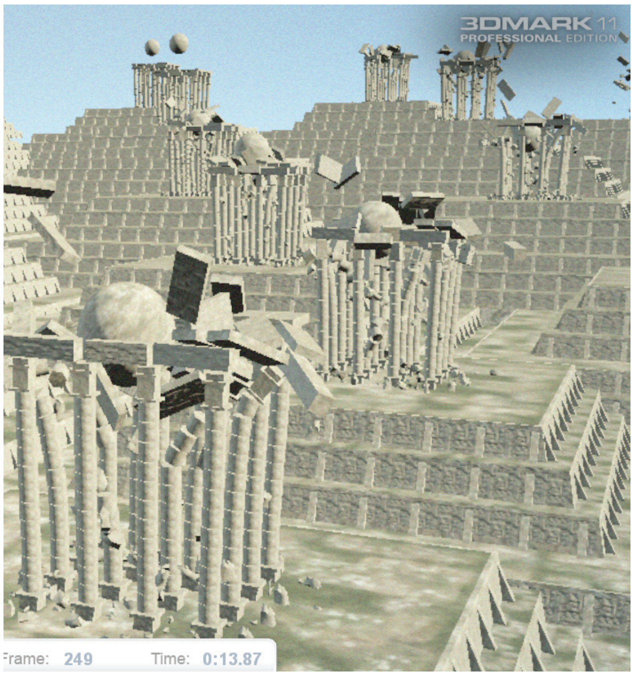
The only differences from the tests run several months ago were BIOS updates to the AM3+ and LGA2011 platforms. Otherwise, we used Windows 7 Professional, a 150GB WD Raptor hard drive, 8GB of DDR3/1600, and a stock GeForce GTX 580, all running the same drivers. For the AMD rig, we reran our tests with both of the hotfixes installed.

The verdict? It's a mixed bag. But let's face it, we shouldn't expect miracles in the first place. AMD has already said the patch adds maybe 1 or 2 percent in some tests and nothing in others. That's about what we saw: Some of the tests offered maybe a couple of ticks of additional performance, while others were the same. Still others showed the pre-patched state being faster. Does that mean the patch is hurting performance? No. More likely we're seeing the normal variances in performance that happen in any benchmark. We are, after all, talking about 1 to 2 points—that's pretty much within the margin of error for most tests. That's likely to disappoint the already dejected AMD faithful who were hoping the patch would give more serious benefits, such as the 10 percent boost predicted from Windows 8, with its fully updated thread scheduler. The bad news is that even with a 10 percent bump in performance from Windows 8's improved scheduler, it's not enough to put the chip in real contention with the Core i7-2600K, 2700K, and certainly not the new Core i7-3820. Even worse, by the time Windows 8 hits the shelves, Intel will likely have moved on to its 22nm Ivy Bridge CPUs. Ivy Bridge won't be a big jump forward on the x86 side of the fence, but it's going to be significant in terms of integrated graphics and power consumption. Still, for anyone running an AMD FX chip, there's no real reason not to install the patch, lest you leave *any* additional performance on the table.

The real battle here is between the 2600K and 3820 parts. When you consider that both chips use what are essentially the same execution cores, any performance difference can be attributed to cache, clock, and memory bandwidth differences. Some of it may also come from motherboard differences, but there's nothing to be done there, as both chips require different motherboards.

We expected this showdown to be close, but our tests, at least with this configuration, showed the Core i7-3820 to have some pretty healthy leads in the benchmarks. It didn't win across the board, but we saw everything from virtual ties to 14 percent performance boosts. For example, in Sony Vegas the Core i7-3820 achieved a considerable bump of 12 percent, in HandBrake about 8 percent, and in Valve's particle test a 9 percent lead over the 2600K. Where does the extra performance come from? Certainly part of it is from the i7-3820's 4 percent clock-speed advantage, but the rest we legitimately give to the memory bandwidth and cache differences between the chips. It's clear to us that the Core i7-3820 is the winning part.

The big question is whether the 3820's better performance is worth the price differences elsewhere in the system. That's really up to you. We continue to think that LGA1155 is a pretty awesome platform for a lot of people. It offers everything from $37 Celerons to $332 Core i7-2700K parts, and within a few months you'll probably have Ivy Bridge parts to pick from, too. Where Core i7-3820 takes over is at the high-end—where you truly need a six-core part or a ton of RAM. Where would you need those six-cores or that much RAM? Work. If your day job is pushing pixels in video, 3D rendering, or any other app where more cores means more free time for you, building on the LGA2011 platform makes sense. If you can't afford a hexa-core processor, the Core i7-3820 lets you build a box with plenty of headroom for the future. We'd also select the Core i7-3820 if we were running a Radeon HD 7970 card. As the sole PCIe 3.0 card out today, we'd want that 10 percent performance bump you get from the faster PCIe 3.0 interface. We'd also go with the Core i7-3820 if we wanted to build either a tri-SLI or tri-CrossFireX rig, where additional PCIe lanes matter.



3DMark 11 is mostly a GPU test, but it does feature a physics test to stress CPUs, too.

BENCHMARK COMPARISON

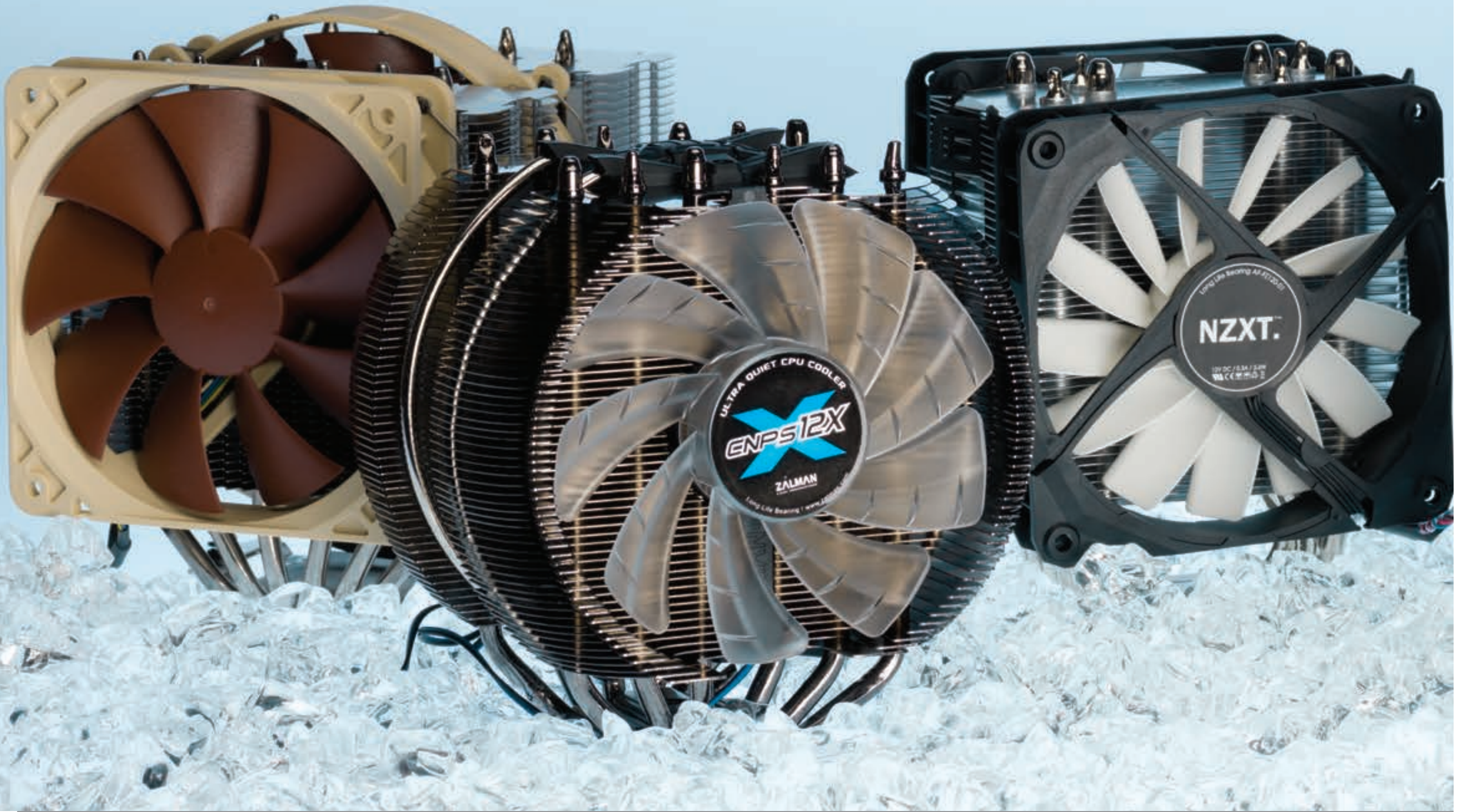
	Core i7-2600K	Core i7-3820	FX-8150 Patched	FX-8150 Pre-patch
Clock	3.46GHz	3.6GHz	3.6GHz	3.6GHz
Cores / Threads	4 / 8	4/8	8	8
PCMark7 Score	**3,450**	3,443	**2,912**	2,838
PCMark7 Lightweight	**2,612**	2,598	2,152	**2,222**
PCMark7 Productivity	2,269	**2,306**	1,903	**1,957**
Cinebench 10 Single-core	6,011	**6,209**	4,006	**4,080**
Cinebench 10 Multi-core	23,315	**24,456**	**20,414**	20,277
Cinebench 11.5	6.84	**7.46**	**6.01**	5.97
POV Ray 3.7 (sec)	218.93	**202.01**	213.1	213.08
Bibble (sec)	137	**129**	**128**	136
Fritz Chess Benchmark	13,065	**14,190**	11,567	**11,704**
Intel Burn Test (GFlops)	**89.7**	87	29	29
Sony Vegas Pro 10 (sec)	2,752	**2,468**	3,312	**2,663**
ProShow Producer (sec)	1,063	**1,004**	**1,164**	1,171
MainConcept (sec)	1,120	**730**	946	**902**
CyberLink Espresso 6.5 using CPU (sec)	379	**309**	430	429
CyberLink Espresso 6.5 using GPU (sec)	329	**306**	426	**412**
7-Zip 64MB load, 12 threads (MIPS)	19,046	**21,485**	19,904	**20,400**
7-Zip 64MB load, max core threads (MIPS)	19,288	**21,590**	20,361	**20,773**
wPrime 4-thread, 1024M	349.27	**353.5**	448	**469**
wPrime 6-thread, 1024M	**293.16**	265.5	353	**357.07**
wPrime 8-thread, 1024M	**248.3**	228.1	293	293.7
wPrime 12-thread, 1024M	**271.2**	245	322	**328.08**
HandBrake (sec)	336	**311**	347	**345**
Sandra (GB/s)	17.6	**37.84**	17.6	17.7
Valve Particle Test (fps)	179	**196**	107	108
Dirt 2 (fps)	189	188.8	115.4	**120**
Far Cry 2 (fps)	202.39	**220**	107	**111.23**
3DMark2011 Score	P6469	**P6653**	**P6146**	P6138
3DMark2011 GPU	6,186	**6,267**	**6,194**	6,167
3DMark2011 Physics	8,184	**9,477**	6,335	**6,426**
3DMark2011 Combined	6,671	**6,759**	**5,580**	5,569

Best scores in each contest are bolded.

CHILLIN' WITH LGA2011

By Nathan Edwards

INTEL'S **NEW ENTHUSIAST** PLATFORM PUTS OUT THE HEAT—HERE ARE **SEVEN WAYS** TO COOL IT OFF



INTEL'S NEW SANDY BRIDGE-E enthusiast platform brings with it a brand-new Intel socket (if you're counting, that's 87 this year alone), and that means new cooler mounting brackets! One nice thing about the X79 chipset: The boards ship with an integrated universal CPU mounting backplate, so no more fiddling around behind the motherboard.

Now, the new chipset has only been out for a few months, so cooler manufacturers are still working on getting their products compatible with the universal backplate. We were able to wrangle up seven LGA2011-compatible coolers, ranging in price from $30 to $120, to see how they cope with the new mounting system and whether they're up to the task of cooling an overclocked Sandy Bridge-E CPU.

We tested each cooler on a test bed with an Asus P9X79 Deluxe motherboard, a i7-3960X CPU, 16GB of DDR3, and a Thermaltake Level 10 GT case with its stock fans running at "high."

The i7-3960X is the flagship Sandy Bridge-E CPU, and contains six cores and support for 40 PCIe lanes. Its Turbo mode hits 3.9GHz out of the box, but we've clocked the proc up to 4.2GHz. We tested each cooler after an hour of idling and an hour of full burn at 4.2GHz, using the Sandy Bridge-E version of Intel's internal thermal testing utility, and measuring the core temperatures with HW-Monitor. To further level the playing field, we're using the same thermal interface material for each cooler, eschewing the included thermal pastes in favor of Arctic Silver's Lumiere, which we've used for all our cooler tests for years. In a sidebar, we'll also talk about the effect of thermal paste on CPU performance.

Because very few of us run our CPUs at 100 percent across all cores for long stretches of time, the burn temperatures represent worst-case scenarios—this should be the hottest these CPUs ever get.

What are you waiting for? Turn the page!

COOLER MASTER HYPER 212 EVO

Meet the new boss, same as the old boss

WHAT, THIS OLD THING? Cooler Master's Hyper 212 Evo is the new-and-improved version of our standby CPU cooler. It's just $35 and offers performance far exceeding other coolers in its price range, so it's the first thing we reach for when we build a new budget-conscious rig. Given that LGA2011 CPUs don't come with heatsinks, the Evo is the closest thing we have to a stock cooler, and it will be the standard against which all other Sandy Bridge-E coolers are judged.

When we reviewed the Hyper 212 Evo in our January 2012 issue, we had two major complaints about it: The backplate mounting procedure remained annoying, and the cooler didn't have LGA2011 mounting support. Both of those problems have now been addressed.

The Hyper 212 Evo is a skyscraper-style heatsink, with four direct-contact copper heat pipes rising into an array of aluminum heat-dissipation fins. From the base of the heat exchanger to the tips of the heat pipes, the cooler is 6.3 inches tall, 3.13 inches deep, and 4.7 inches wide with the included 12cm PWM fan attached.

Thanks to the unified backplate on the LGA2011 socket (a crossover from Intel's Xeon platforms), the Evo's mounting process is greatly simplified. The LGA2011 X-shaped crossbar now screws directly into the mounting holes on the included backplate. No more accidentally unscrewing mounting bolts when removing the cooler.

In our test bed, the Evo continues to impress, cooling our i7-3960X at 4.2GHz down to 74 C. It's not the best cooler in this roundup, but it outperforms coolers three times its price. And although its height may be a concern in narrow cases, the heatsink and fan do not interfere with any RAM slots, unlike many other coolers in this roundup. The Evo remains an inexpensive, inexplicably kick-ass cooler.

SPECIFICATIONS

Dimensions HxDxW (inches, with fans)	6.3x3.13x4.7
Weight	1 lb, 4.6 oz
Heat Pipes	4 copper direct-contact
Stock Fans	1x 12cm PWM
Add'l Fan Support	1 (clips included)

Cooler Master Hyper 212 Evo

$35, www.coolermaster-usa.com

VERDICT 9 KICK ASS!

NZXT HAVIK 120

NZXT's second air cooler, and they still can't spell 'havoc'

NZXT DIDN'T ENTER the CPU cooling game until quite recently. We reviewed its first cooler, the skyscraper Havik 140, in December 2011. The Havik 140's dual 14cm fans helped it power to the top of our air-cooling charts, though the slightly cheap-feeling mounting bracket kept it from Kick Ass Award status. NZXT's second air cooler is the smaller, less expensive Havik 120.

The Havik 120 stands 6.4 inches tall, 4.5 inches deep, and 5 inches wide with both 12cm fans strapped on—just about a quarter of an inch shallower and narrower than the 140. The Havik weighs more than two pounds, and has four fat heat pipes to the 140's six. The Havik 120's mounting mechanism uses the bars-and-crossbeam model from the 140, and installation is easy. The cooler's two 13-bladed, 12cm fans have 3-pin connectors, and connect to one of two Y-splitters (one with a speed-limiting resistor). The fans attach to the cooling fins with rubber straps, which is not the most convenient mounting mechanism, especially when the motherboard is already mounted in the case.

The Havik 120 performed second-best of the five air coolers we tested, dropping the overclocked i7-3960X to 73.7 C at full burn. Using the included resistor splitter cable increased CPU temperatures by a few degrees but reduced noise to quite low levels.

We like that the Havik 120's fin stack is high enough so the fans don't interfere with most RAM DIMMs, and that it performs well without being too loud. It's neither as quiet nor as effective as the 140, but it's smaller. At $55, it's a good midpoint between the $30 coolers in our roundup and those in the $80-100 range.

SPECIFICATIONS

Dimensions HxDxW (inches, with fans)	6.4x4.5x5
Weight	2 lbs, 1.1 oz
Heat Pipes	4 direct-contact
Stock Fans	2x 12cm 3-pin (w/ splitter / resistor cables)
Add'l Fan Support	No

NZXT Havik 120

$55, www.nzxt.com

VERDICT 8

XIGMATEK GAIA

A challenger appears!

SOMETIMES WHEN we use the Hyper 212 Plus in a build we get comments to the effect of, "Why don't you use Xigmatek's Gaia? It's just as good and just as cheap!" Just as cheap? Definitely. Just as good? We'll see!

Stop us if you've heard this before: The Gaia is a skyscraper-style stack of aluminum cooling fins on top of three direct-contact copper heat pipes. The Gaia is 6.5 inches high by 2.9 inches thick (with the fan) and 4.9 inches wide. At one pound, 4.7 ounces, it's practically the same weight as the Hyper 212 Evo. Aside from the slightly narrower cooling fins and the fact that it has three heat pipes rather than four—and that its 12cm PWM fan is held on by rubber pegs rather than a plastic clip—the Gaia looks a lot like the Evo.

On LGA2011, the Gaia's install process is pretty easy. Four double-sided thumbscrews screw into the universal backplate, a mounting plate screws onto either side of the heatsink and mounts onto those thumbscrews, and then four nuts secure the mounting bracket. There are no screws or any other way of putting pressure on the heat exchanger other than tightening the mounting nuts as far as possible. The rubber fan mounts pop into slots cut into the sides of the cooling fins, which is great for damping vibrations but not as easy to attach or remove as plastic or wire clips.

The Xigmatek Gaia cooled our overclocked i7-3960X to 75.7 C in our burn test, within two degrees Celsius of the Hyper 212 Evo. We still prefer the Evo's installation procedure, at least for LGA2011, and don't mind the $5 price premium, but the Gaia is nearly as good as the Hyper 212 Evo, and even less expensive.

Xigmatek Gaia

$30, www.xigmatek.com

VERDICT

8

SPECIFICATIONS

Dimensions HxDxW (inches, with fans)	6.5x2.9x4.9
Weight	1 lb, 4.7 oz
Heat pipes	3 copper direct-contact
Stock Fans	1x 12cm PWM
Add'l Fan Support	1 (rubber mounts included)

AD

NOCTUA NH-D14 SE2011

Cooling prowess as massive as its dual heatsinks

WHEN WE REVIEWED the first-edition Noctua NH-D14 back in April 2010, we praised its quiet performance, but our then-current test bed didn't put out enough heat to best showcase its cooling chops. Fortunately, our new one does. This coincides nicely with Noctua's release of the NH-D14 SE2011, which includes (gasp) LGA2011 support and updates the D14's two fans to include PWM, or pulse-width modulation.

The new NH-D14 is just as massive as the old one. With both fans attached, the heatsink stands 6.5 inches high, 6.2 inches deep, and 5.5 inches wide and weighs more than two pounds, 12 ounces. The cooler's six heat pipes rise into two sets of cooling fins, each the size of a lesser cooler's entire allotment. A 12cm PWM fan clips to the front and a 14cm fan clips between the two sets of fins, both using Noctua's wire clips, which are easy to install and remove. Installation is easy; just remove the center fan, mount four double-sided thumbscrews to the unified backplate, install two mounting bars over those, secure them with thumbscrews, and tighten the two spring-screws on the D14 onto the posts on the mounting bracket.

Because it's so massive, the NH-D14 blocks some RAM slots; we had to use low-profile RAM in order to fit the 12cm fan onto the cooler. But once that was accomplished, the NH-D14 achieved the lowest CPU burn temps of any air cooler in our roundup, at just over 72 C. When we added the resistor cables, the temperature increased to 76 C, but fan noise became almost imperceptible—certainly quieter than the case fans.

Of the air coolers we've tested on LGA2011 thus far, the NH-D14 takes the crown. If it weren't quite so massive, it'd be even easier to recommend, but it still garners our firm approval.

SPECIFICATIONS

Dimensions HxDxW (inches, with fans)	6.5x6.2x5.5
Weight	2 lbs, 12.8 oz
Heat Pipes	6
Stock Fans	1x 12cm, 1x 14cm, PWM
Add'l Fan Support	1

Noctua NH-D14 SE2011

$85, www.noctua.at

VERDICT 9

ZALMAN CNPS12X

It looks cooler than it is

THE CNPS12X MIGHT be Zalman's most eye-catching cooler, with two arrays of black-nickel-coated cooling fins and *three* 12cm fans to push air through them. And it is massive. It's 6.1 inches tall, 5.25 inches deep, and more than 6 inches wide, and weighs two pounds, four ounces. It's so big it overhangs the inner *four* RAM slots on our Asus P9X79 Deluxe test motherboard, requiring the use of RAM without tall heat spreaders. The six direct-contact heat pipes rise into two sets of cooling fins, with the front and rear fans nestled into their respective fins, and the middle fan in between the two sets. All three fans are controlled via a single 3-pin power connector.

Installation of the CNPS12X is a pain. Zalman has adopted the common mounting system of two parallel mounting bars with a perpendicular crossbar that bolts to each mounting bar and keeps the cooler in place. Alas, Zalman's system is flimsy and uses the same skinny hex bolts we complained about in our 9900MAX review (February 2011), and those require a special (included) hex wrench. The bolts are hard to access, thanks to their position directly below the center fan, and don't seem to be able to apply much pressure to the heatsink.

Whether because of this or simply the nickel finish on the entire heat exchanger, the CNPS12X performed poorly on our overclocked system, getting the CPU to just below 78 C. Lest we base the score on an isolated incident, we installed the cooler several times over several days and got the same performance.

Without the included resistor cable, the CNPS12X is quiet. It's *very* quiet with the resistor cable, so if you're not overclocking, the CNPS12X is an appealing and beautiful cooler. But given the flimsiness and frustration of the install process, we can't recommend it for overclocked LGA2011 cooling.

SPECIFICATIONS

Dimensions HxDxW (inches, with fans)	6.1x5.25x6
Weight	2 lbs, 3.8 oz
Heat Pipes	6 direct-contact
Stock Fans	3x 12cm, 1x 3-pin connector
Add'l Fan Support	No

Zalman CNPS12X

$100, www.zalman.com

VERDICT 7

INTEL RTS2011LC

Underwhelming in the extreme

INTEL ISN'T SHIPPING stock heatsinks with Sandy Bridge-E CPUs, perhaps assuming that consumers of $600 and $1,000 CPUs are going to want performance a little better than Intel's stock coolers have typically provided. Instead, Intel is offering a branded liquid-cooling loop as an optional accessory. The Asetek-built cooling loop features a glowing blue Intel logo and a bright blue LED on its single 12cm fan, but otherwise looks nearly identical to the Antec Kühler 620, which was also built by Asetek (the company that *also* built AMD's Bulldozer-branded liquid- cooling loop).

The RTS2011LC uses Asetek's low-profile pump unit/heat exchanger and a 120mm radiator that's less than an inch thick and mounts in place of a stock case fan (typically the rear exhaust fan). The heat exchanger mounts to the LGA2011 socket using Asetek's standard barb-and-ledge mounting system, although with big solid posts instead of the flimsy screws and plastic clips Asetek used to use. The PWM fan plugs into the pump, which plugs into the CPU_FAN header.

Alas, the cooler's single fan and radiator were no match for any of the air coolers in our roundup, save one. The RTS2011LC tied with the Zalman CNPS12X for last place, and its 12cm fan was irritatingly loud at full speed. For stock-clocked chips, the Intel cooler is fine. It's quiet when not fully ramped up, and it doesn't block any RAM slots, unlike the Noctua and Zalman coolers. But for an overclocked Sandy Bridge-E CPU, the Intel liquid cooler is louder and hotter than the Cooler Master, Noctua, Xigmatek, and NZXT coolers, and more expensive than all but the Noctua, which is just $5 more. If you want a great liquid-cooling solution for an overclocked LGA2011 chip, keep looking.

Intel RTS2011LC

$80, www.intel.com

VERDICT 7

SPECIFICATIONS

Dimensions HxDxW (inches, with fans)	6x2.6x4.75
Weight	1.25x2.5x2.5 (circular)
Heat pipes	1lb, 12.5 oz (total)
Stock Fans	1x 12cm PWM
Add'l Fan Support	1x

DOES THERMAL PASTE MATTER?

Thermal paste is important. It's what fills all the microscopic gaps between your CPU and cooler so that as much heat as possible can escape from your CPU. But does a particular thermal paste matter? While our Sandy Bridge-E test bed was occupied testing coolers, we put an X58 system to work on thermal pastes.

We took a Core i7-975 CPU and overclocked it to 3.9GHz on an Asus P6X58D Premium board in an open-air test bench. We tested 17 thermal pastes with a Thermaltake Frio OCK with its fans set to maximum, first at idle and then after several hours of full burn. This test bed wound up being far hotter than the more efficient Core i7-3960X in our Sandy Bridge-E machine, and the heat really brought out the differences between the thermal pastes—to the tune of a 10 C delta between the best and worst pastes in our roundup.

The difference between the thermal pastes was less pronounced on our Sandy Bridge-E test bed. We took the Noctua NH-D14 SE2011 and tested it first with the Lumiere, as we did in the roundup, and next with the NT-H1 thermal paste that came with it, which performed very well in our thermal paste roundup. We saw an 8 C difference between the Lumiere and the NT-H1 with the Frio OCK on our X58 test bed, but on the X79 system with the Noctua cooler the difference was negligible—well within the 2 C margin of error. This could be due to the lower overall temperatures of our X79 system, the Noctua's mounting system putting more pressure on the CPU heat exchanger, or airflow within the case itself.

So does thermal paste matter? It depends on how hot your CPU gets—the cooler the CPU, the lower the difference between pastes. It's only at the high end that the differences get pronounced. In that case, you'd be better off with the 11 pastes that get our Geek Tested & Approved stamp than with the pastes that don't. For the full report on our thermal paste roundup, go to bit.ly/yKJ1zk.

SPECIFICATIONS

	Geek Tested & Approved	Idle Temperatures	Burn Temperatures
Tuniq TX-4	Y	**40**	**79.5**
Tuniq TX-2	Y	41	80
ShinEtsu MicroSI X23-7783d	Y	**40**	80.25
Prolimatech PK-1	Y	41.25	80.5
Arctic Cooling MX-4	Y	41	81
Arctic MX-2	Y	40.75	81
Noctua NT-H1	Y	41	81.25
Xigmatek PTI-G4512	Y	**40**	81.25
ZeroTherm ZT-100	Y	41	81.5
CM Thermalfusion 400	Y	41	81.75
Arctic Silver 5	Y	41.5	82.5
Xigmatek PTI-G3606	N	42.25	84.5
Rosewill RCX-TC090 Pro	N	41.75	85.5
Arctic Silver Arctic Alumina	N	42.75	85.5
Arctic Silver Lumiere (zero-point)	N	43.75	89
BioStar Nano Diamond	N	43.25	89
Zalman ZMSTG1	N	43.25	89.25

Best scores bolded. All tests performed on an overclocked Core i7-975 @ 3.9GHz (burn) and 2.1GHz (idle) on an Asus P6X58D Premium motherboard with 6GB Corsair XMS3 DDR3, a Radeon HD 5850, and 850W Antec TruePower PSU. The CPU cooler used was a Thermaltake Frio OCK with its fans set to maximum speed. Temperatures recorded after one hour at idle and after three hours of full-burn testing using Intel's internal Nehalem stress-testing utility. We use HWMonitor to determine core temperatures and TMonitor to keep an eye on clock speeds.

CORSAIR H100

Double your radiator space, double your fun

ANOTHER ALL-IN-ONE liquid-cooling loop! Hooray! Corsair's H100 is its *fifth* liquid cooler; after two with Asetek, the company has put out three with CoolIT. The H60 is your standard 120mm radiator-with-single-fan, the H80 is the double-thick double-fan version, and the H100, Corsair's first liquid-cooler to support LGA2011, is also its first cooler with a 240mm radiator.

The H100's radiator is around an inch thick and 10.8 inches long and fits in any case that can accommodate a 240mm radiator, though some cases may not have the vertical clearance to mount the fans inside the case. The pump/heat exchange unit is square and very slightly taller than Asetek's. It contains four 4-pin PWM headers to control the radiator fans, as well as a connector for Corsair's Link system control software/hardware combo (sold separately). There's also a three-speed fan-control button on top of the pump. The pump unit itself has a 3-pin motherboard fan connector and a 2-pin Molex for power. The cooler unit mount is simple: Four double-sided thumbscrews mount to the unified backplate, the brackets at the corners of the pump unit slide onto those, and more thumbscrews secure them in place.

We mounted the radiator to the top panel of our Thermaltake Level 10 GT test bed, with the fans on the inside pushing air through the radiator out of the case. In this configuration, with the H100's fan speed set to medium, the Corsair cooler lowered our CPU's burn temperature to 69.2 C—the best of any cooler in our roundup. Even with the fans at their lowest setting, the H100 was a match for the air coolers in the roundup.

Its 240mm radiator won't fit in every case, and it's the most expensive in our roundup, but the H100 is a competent, quiet liquid cooler and the best LGA2011 cooler we've yet tested.

Corsair H100

$110, www.corsair.com

SPECIFICATIONS

Dimensions HxDxW (inches, with fans)	10.8x2x4.7
Weight	1.6x2.6x2.6 (square)
Heat pipes	2 lbs, 2.5 oz
Stock Fans	2x 12cm, 3-pin
Add'l Fan Support	2x

VERDICT 9 KICK ASS!

KEEP YOUR COOL

Bigger and more expensive coolers aren't always better

THIS IS THE BIGGEST cooler roundup we've done in years, and it was enlightening. First, we really appreciate Intel finally bringing a unified backplate to a consumer-level CPU socket, and hope the trend continues, as it makes cooler installation much less irritating. However, some mounting systems still manage to be frustrating. Zalman's CNPS12X mounting bracket is likely responsible for its poor cooling performance.

The most interesting thing about our test results is that price and performance aren't strongly correlated. The cooler with the fourth-best performance, the Hyper 212 Evo, is just $35, and only 5 C hotter than the best cooler, which costs four times as much. Heck, it's better than both the Zalman, which is $70 more expensive, and the Intel liquid cooler, which is $45 more. Both the Cooler Master and Xigmatek budget coolers earn our recommendation for low-to-medium overclocks.

We got the best performance in this roundup from Corsair's 240mm-radiator H100, and if you have the room in your case, you'll find it a quiet, effective solution that doesn't block any RAM slots. Adding a couple more fans will only make it better.

NZXT's Havik 120 and Noctua's DH-14 are both great coolers, as well; the Noctua is much larger and quieter (though you'll need low-profile RAM), while the Havik is more compact and cheaper and shouldn't conflict with your RAM. We bet it hits the sweet spot for a lot of users.

We'd recommend either the Havik 120 or the DH-14 over the Intel liquid cooler, or any single-fan, single-radiator liquid cooler. They're cooler and quieter and they fail better; an all-in-one with a broken pump isn't a cooler, but a massive stack of cooling fins with a broken fan is still a massive stack of cooling fins. And in the end, isn't keeping cool what matters?

SPECIFICATIONS

	CM Hyper 212 Evo	NZXT Havik 120	Xigmatek Gaia	Noctua DH-14	Zalman CNPS12X	Intel RTS2011LC	Corsair H100
Ambient Air	23.8	25	25.1	25.2	24.2	25	25
Idle Temperature	36.2	34.8	35.5	34.1	35.2	35.2	**33.2**
Burn Temperature	74	73.7	75.7	72.3	77.8	77.8	**69.2**

All temperatures in degrees Celsius. Best scores bolded. All tests performed using an Intel Core i7-3960 at 4.2GHz, on an Asus P9X79 Deluxe motherboard with 16GB DDR3/1600, in a Thermaltake Level 10 GT with stock fans set to High.

WHITE PAP

BY BILL O'BRIEN

DisplayPort 1.2

Meet HDMI's smarter brother

DisplayPort has made a few timid steps forward since its 2006 introduction; but based on what we saw at CES in January, 2012 might be the year it finally breaks through to mainstream usage.

VESA (the Video Electronics Standards Association) designed DisplayPort to be a royalty-free means of delivering digital audio and video signals from a source device to a display. As such, it was intended to allow the retirement of both DVI (the Digital Visual Interface) and VGA (Video Graphics Array), which outlived its usefulness shortly after DVI appeared on the scene. DisplayPort can be used to connect computers to desktop monitors and televisions, as well as internally (in a laptop or all-in-one computer, for instance).

DISPLAYPORT VERSIONS

The original specification supported a maximum data rate of 8.64Gb/s on a two-meter copper cable. In 2007, DisplayPort 1.1a added support for fiber-optic cable, which can carry signals more than 15 meters without developing ghosting or other signal-degradation problems. Version 1.1a also added support for the DRM systems HDCP (commonly used in consumer electronics gear) and DPCP (DisplayPort Content Protection).

DisplayPort 1.2, introduced in 2009, doubled effective bandwidth to 17.28Gb/s, rendering the standard capable of delivering higher resolutions and refresh rates, as well as increased color depth. DisplayPort 1.2 can also carry multiple independent video streams (to support multiple monitors in a daisy-chain fashion), and it supports stereoscopic 3D. This version increased auxiliary channel bandwidth to a maximum of 720Mb/s (for device management and control, including the bi-directional carriage of USB signals); expanded color spaces to include xvYCC, scRGB, and Adobe RGB 1998; and added support for Global Time Code (GTC), to enable sub-1-microsecond audio/video synchronization.

Aside from its USB capability, DisplayPort 1.2 sounds a lot like HDMI, doesn't it? Craig Wiley, chairman of the VESA board of directors, begs to differ. "Today, DisplayPort and HDMI really address two different markets. What is important to TV manufacturers isn't to PC manufacturers, and vice versa. Because of this, we do believe the two standards will coexist as external interfaces for the foreseeable future. That being said, Embedded DisplayPort and MYDP—Mobility DisplayPort, an improved version of the DisplayPort standard for mobile devices—provide additional avenues for DisplayPort to gain adoption. As devices trend toward smaller form factors and become more mobile, we see this as a major growth opportunity for us."

VESA showed several prototype Mobility DisplayPort devices at CES. MYDP is designed to simplify the process of streaming audio and video from a mobile device to a large display—without adding another port to the mobile device. It accomplishes this trick by sending high-definition video out the device's Micro USB port to a cable equipped with a USB plug on one end and a DisplayPort, HDMI, or VGA plug on the other. The new standard will also allow video conference calls by tapping into the camera on your phone or tablet.

Unfortunately, this requires a chip on the sending device that switches between DisplayPort mode and USB mode, so it won't be possible to retrofit your existing phone or tablet. No changes are required at the display end, however, and the device's battery can be charged at the same time (the DisplayPort 1.2a spec will boost power output from a current 1.5 watts to 9 watts).

HOW DISPLAYPORT WORKS

DisplayPort uses a self-clocking packet-based communications protocol, similar to what's used in Ethernet, USB, and PCI Express. This packet approach renders DisplayPort extensible; i.e., new features can be added without requiring significant changes to the physical interface. A DisplayPort connector supports one, two, or four differential data pairs (aka lanes) in a main link. Each lane has a raw bitrate of 1.62-, 2.7-, or 5.4Gb/s, clocked at 162-, 270-, or 540MHz. Data is 8b/10b encoded, meaning that every eight bits of information is encoded with a 10-bit symbol to achieve an effective (post-decoding) data rate of 1.296-, 2.16-, or 4.32Gb/s per lane (80 percent of the raw bitrate).

You might be surprised to learn that the DisplayPort spec treats both audio and video signals as optional. A DisplayPort cable might carry only audio content, only video content, or both audio and video simultaneously. DisplayPort's video signal path supports 6–16 bits per color channel, and the audio path can carry up to eight channels of uncompressed linear PCM audio encoded at resolutions of 16–24 bits and at sampling rates of 32–192kHz.

A 720Mb/s, bi-directional, half-duplex auxiliary channel on DisplayPort's main link provides device management and control. It supports communications protocols such as EDID (Extended Display Identification Data), DPMS (Display Power Management Signal-

ER

ing), and MCCS (Monitor Command Control Set) that enable a display to inform its host of its capabilities and the host to manage the display's settings and power state. Unlike HDMI, DisplayPort does not support AV.link, a low-bandwidth command-and-control protocol common in the consumer-electronics industry. AV.link enables the host to send remote-control commands to the client. HDMI uses CEC (Consumer Electronics Control) to carry AV.link data on a single wire, so DisplayPort's aux channel could conceivably be used for this same purpose.

Dual-mode DisplayPort chipsets are capable of emitting single-link HDMI and DVI signals with the connection of the appropriate passive adapter. The chipset detects the presence of the adapter and automatically switches to DVI/HDMI mode. Dual-mode ports, which are present on most DisplayPort-compatible videocards and displays, are marked with a DP++ logo. An active adapter is required to support dual-link DVI and analog component video devices (including VGA), due to DisplayPort's limited pin count.

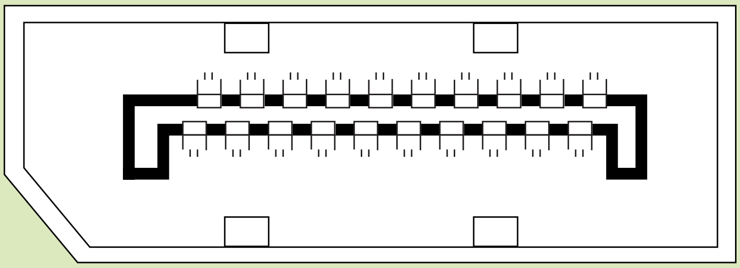
PROSPECTS

VESA hasn't delivered the long ball every time it has come up to bat, so there's no guarantee that DisplayPort 1.2 will achieve the prominence VESA is hoping for. Two things do stand in its favor: First, the demand for multiple-display technology is on the rise, thanks in large measure to gamers (especially flight-sim fans) and businesses (especially in the financial sector, where stock tickers, spreadsheets, and other analysis software all run simultaneously). DisplayPort delivers a much better multi-display solution than HDMI is currently capable of delivering.

The second factor in DisplayPort's favor is that it's not absolutely necessary to purchase a brand-new monitor in order to utilize it, thanks to the availability of DVI and VGA adapters. Bells and whistles will attract early adopters to almost any new technology, but only a solid return on investment will ensure its long-term viability. With innovative new features, backward compatibility, and reduced manufacturing costs, DisplayPort is finally showing it has legs.

DisplayPort 1.2 Pin Out

Here's what's happening behind the scenes of an external source-side connector. The spec's packet-based approach makes it possible to add new features without significantly changing the physical interface.

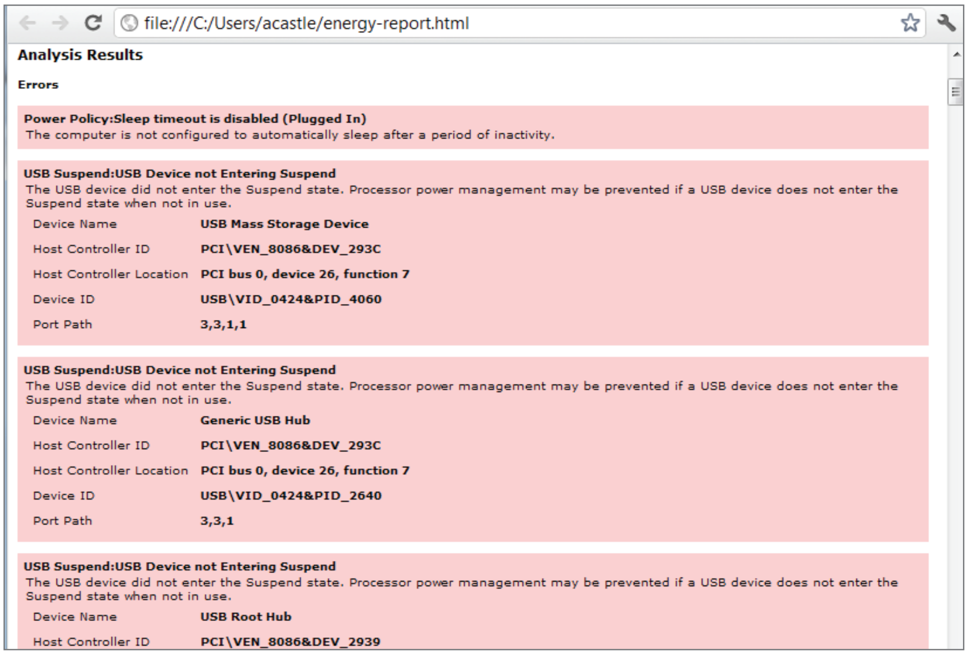


Pin 1	ML_Lane 0 (p)	Lane 0 (positive)
Pin 2	GND	Ground
Pin 3	ML_Lane 0 (n)	Lane 0 (negative)
Pin 4	ML_Lane 1 (p)	Lane 1 (positive)
Pin 5	GND	Ground
Pin 6	ML_Lane 1 (n)	Lane 0 (negative)
Pin 7	ML_Lane 2 (p)	Lane 2 (positive)
Pin 8	GND	Ground
Pin 9	ML_Lane 2 (n)	Lane 2 (negative)
Pin 10	ML_Lane 3 (p)	Lane 3 (positive)
Pin 11	GND	Ground
Pin 12	ML_Lane 3 (n)	Lane 3 (negative)
Pin 13	CONFIG1	Connected to Ground
Pin 14	CONFIG2	Connected to Ground
Pin 15	AUX CH (p)	Auxiliary Channel (positive)
Pin 16	GND	Ground
Pin 17	AUX CH (p)	Auxiliary Channel (negative)
Pin 18	Hot Plug	Hot Plug Defect
Pin 19	Return	Return for Power
Pin 20	DP_PWR	Power for Connector (3.3 V 500 mA)

HOW TO

STEP-BY-STEP GUIDES TO IMPROVING YOUR PC

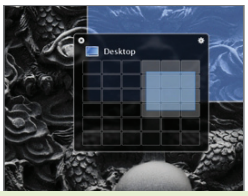
WINDOWS TIP OF THE MONTH



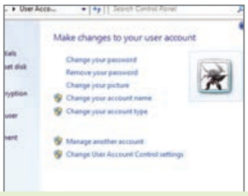
GET A POWER EFFICIENCY REPORT

If your laptop battery just can't seem to stay charged, or your electric bill seems out of control, Windows 7 may be able to help. To get a detailed power consumption report in the folder of your choice, open a command prompt, and type `powercfg -energy -output \FolderName\Report.html`

MAKE - USE - CREATE



64 Master Your Desktop Work-flow with Divvy



65 Mount SkyDrive Cloud Storage as a Hard Drive

ALEX CASTLE
ONLINE MANAGING EDITOR

BOOKMARK MANAGEMENT

IF YOU'VE HAD time to look through our huge website feature (page 26), you've probably found a bunch of websites to check out, and some that you'll want to go back to again and again. How do you keep track of all of them? Here are three of my favorite ways to keep track of bookmarks:

Chrome – One of my favorite features of the Chrome browser is that it has built-in bookmark synching. Just be sure to sign in with your Google account.

XMarks – If you just can't commit to a single browser, sync across all of them with XMarks, at www.xmarks.com.

Delicious – After going offline for a while, Delicious is back, with a snazzier-than-ever interface. If you don't remember it from the Del.icio.us days, Delicious is a free social bookmarking site that's excellent for storing, organizing, and sharing all your favorite sites. www.delicious.com

↘ submit your How To project idea to: comments@maximumpc.com

Manage Your Desktop Workflow with Divvy

—Seamus Bellamy

ONE OF THE PROBLEMS with Windows is that in order to be productive, we're often forced to contend with a whole lot of, well, windows. It might be acceptable to minimize your Outlook and iTunes windows while you're cranking on a document in Microsoft Word, but if you're working on a small screen and need to constantly refer to research or source material as you type, juggling multiple open windows is a must. While clicking between open windows on your desktop might get the job done, it isn't all that efficient. Instead, we recommend using a window management program like Divvy. Originally it was only available to Mac users, but development house Mizage has finally seen the light, bringing its slick, easy-to-use brand of window management to Windows machines. To get started with Divvy, take the following steps.

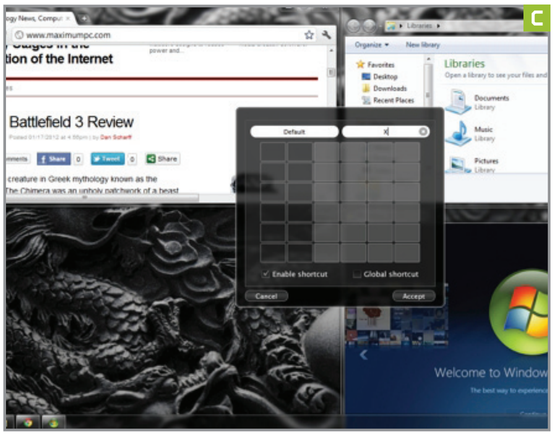
1 DOWNLOAD AND INSTALL DIVVY Navigate to Mizage's website at www.mizage.com/#windivvy and download Divvy—available as a free trial (it's nagware) or to buy for $15. Click the application's installer .exe file and install the software to your computer.

2 GET COMFORTABLE WITH DIVVY Once installed, you'll be given the option to open Divvy; you can also hunt the program down in your Start menu and launch it. Once Divvy is launched, you'll be presented with a grid of squares representing your PC's desktop **(image A)**. If you accidentally close the Divvy grid, don't panic. You can reopen it by clicking on the Divvy icon located in your menu taskbar's notification area. Without clicking, mouse over the grid. As your mouse pointer passes over different areas of the grid, a corresponding area of your PC's desktop will be highlighted. By clicking and dragging your pointers across the grid, you can select multiple boxes.

» Click the cog icon in the top-right corner of the Divvy interface. You now have access to Divvy's preferences **(image B)**, which can be customized through options on three different panes: General, which allows you to set the application's startup behavior and shortcut settings; the Appearance pane, which allows you to tinker with the size allocated to each box on your Divvy desktop grid as well as the spaces in between each box; and Shortcuts, which allows for—you guessed it—the creation of user-defined shortcuts. To find out why, read on.

3 PUT IT TO WORK Now that you know the lay of the land, it's time to put Divvy to work. Open a windowed program, and then open the Divvy grid by clicking its notification center icon. To automatically change the size of the open window on your desktop, click and drag the space in the grid you'd like to see the window occupy. When you release your mouse button, Divvy will automatically resize your window. This process can be completed multiple times for multiple windows, making it easy to set up your desktop as a multi-windowed workspace **(image C)**. The process of hacking your windows down to size becomes even easier once you bring a few custom shortcuts into play.

» To choose a window size, open Divvy's shortcut panel, click New, and drag your mouse across the grid that appears. Next, choose a shortcut key for this window size and click Accept. Moving forward, the shortcut will be active any time you open the Divvy interface. To make the Divvy interface more accessible, users can turn to Divvy's General pane and set a custom shortcut there as well, all of which makes managing your desktop's open windows as easy as tapping on a few keys.

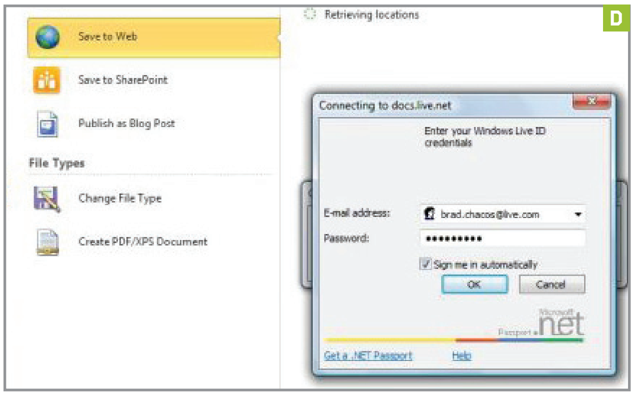


Mount a SkyDrive Virtual Drive –Brad Chacos

ACCESSING YOUR DATA from virtually anywhere is easier than ever thanks to the rise of the cloud. Microsoft's SkyDrive provides a ridiculous 25GB of free storage, which is way more than the competitors, but accessing files using its web-based interface can be tedious, to put it nicely. We'll show you how to map your SkyDrive account as a network drive, which makes saving files to SkyDrive as simple as saving files to your C: drive. As a bonus, your Windows 7 PC won't be left out of the loop when Windows 8 and its built-in SkyDrive integration hit the streets later this year.

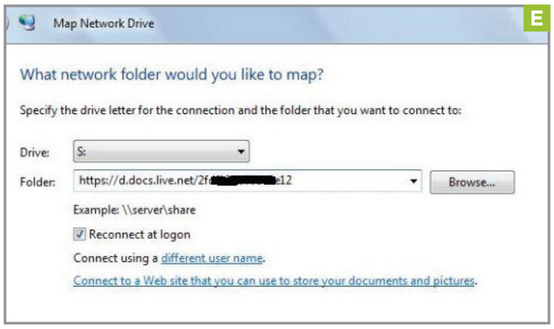
1 DISCOVERING YOUR SKYDRIVE'S URL You'll need a free Windows Live account and a copy of Microsoft Office 2010 to pull this off, so if you don't have those, go get them and then come back! (The trial version of Office works just fine if you don't feel like spending $100 for the full-blown suite.) Make sure to activate your SkyDrive by going to skydrive.live.com. Next, open an Office document, then select File > Save & Send > Save to Web > Sign In (to SkyDrive). Sign in with your Windows Live ID and password when prompted **(image D)**.

» You'll see a list of the folders in your SkyDrive. Pick any one, then click Save As. Don't be surprised if your PC freaks out and tosses up a "Not Responding" message here; just wait it out. Eventually a dialog box pops up. See the list of folders on the left side? Click the one that looks like a long string of letters and numbers—that's your main SkyDrive folder. A URL appears in the address bar at the top of the screen. Copy it, then close any open Microsoft Office documents.



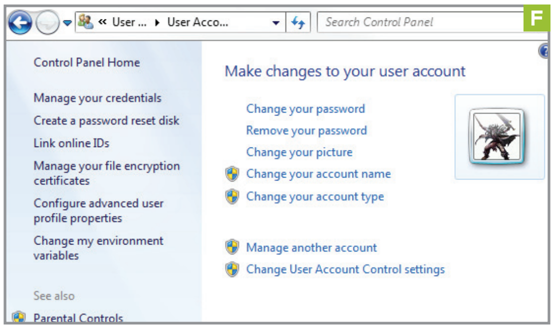
2 MAPPING SKYDRIVE AS A NETWORK DRIVE Now it's just a simple matter of mapping your SkyDrive the way you would any other network drive. Bring up the Start menu and right-click Computer, then select "Map network drive." Paste the SkyDrive URL into the Folder field, then choose a letter for the network drive. (We like "S," for SkyDrive.) Check the "Reconnect at login" box, then click "Connect using a different user name" and re-enter your Windows Live ID information. Click Finish to, well, finish **(image E)**.

» Your SkyDrive folder appears as a network drive, complete with its Documents, Music, Public, and Pictures subfolders.



3 LINKING YOUR WINDOWS LIVE ID WITH YOUR WINDOWS USER ACCOUNT Theoretically, that's it, but in actuality you'll need to manually reconnect to Windows Live every time you reboot your computer. Linking your Windows Live ID with your Windows 7 user account bypasses that hassle.

» Crack open the Start menu one more time and find the User Accounts settings in the Control Panel. You'll see a "Link online IDs" option on the left side of the window **(image F)**. Just click that, and Windows will hold you by the hand the rest of the way. Be sure to sign in with the same Windows Live ID associated with the network-mapped SkyDrive account!



QUIRKS OF A NETWORK-MAPPED SKYDRIVE

Remember that although your SkyDrive appears to reside on your computer, it still lives in the cloud; as such, you'll need to download/upload files you want to open or save, which obviously requires an active Internet connection. Uploads are just as slow as they are using the web-based interface, and individual files have a 100MB cap. Also, the Properties option for mapped SkyDrives shows incorrect storage information, so you'll need to hop online and check out your remaining space allotment every now and then.

BUILD IT

NATHAN EDWARDS **SENIOR EDITOR**

(CrossFire)X Marks the Spot

X79. CrossFireX. XMP. This month I'm going to build a gaming rig that tears our benchmarks a new one. Or several new ones

LENGTH OF TIME: **2 HOURS** | LEVEL OF DIFFICULTY: **INTERMEDIATE**

THE MISSION My first X79 build, back in January 2012, was pretty modest. Well, as modest as a PC with a 1,000-dollar processor can be. It performed well in CPU-intensive benchmarks, but it had only a single GTX 580, so it did about a third as well as top-tier systems in graphics tests.

Back when I built that PC, the Core i7-3960X was the only Sandy Bridge-E CPU available to us, and the GTX 580 was the fastest single-GPU card on the market. Well, this time I'm going to build a Sandy Bridge-E system with the new quad-core Core i7-3820 and the new fastest single-GPU videocard on the market: AMD's Radeon HD 7970.

Wait, just kidding. I'm not going to use a 7970. I'm going to use three of 'em!

INGREDIENTS

PART/URL	PRICE
Case NZXT Switch 810 www.nzxt.com	$170
PSU Silverstone Strider Gold 1200W www.silverstonetek.com	$270
Mobo Gigabyte X79-UD5 www.gigabyte.com	$325
CPU Intel Core i7-3820 www.intel.com	$285
Cooler Noctua NH-D14 SE2011 www.noctua.at	$90
GPU 3x AMD Radeon HD 7970 www.amd.com	$1,650
RAM 16GB G.Skill Ripjaws DDR3/2133 www.gskill.com	$160
Optical Drive Samsung SH-222AB CD/DVD burner www.samsung.com	$20
SSD Samsung 830 Series 256 GB www.samsung.com	$360
Hard Drive 3GB Seagate Momentus www.seagate.com	$230
OS Windows 7 Professional 64-bit (OEM) www.microsoft.com	$139
Extra Fan Xigmatek XAF-F1452 14cm www.xigmatek.com	$24
TOTAL	$3,723

TRIPLE YOUR VIDEO POWER, TRIPLE YOUR FUN

SINCE I KNOW I want to use three Radeon HD 7970s in CrossFireX configuration, I'll need an X79 motherboard that supports CrossFireX. Gigabyte's X79-UD5 has three x16 PCIe 3.0 slots, as well as a nifty backup BIOS that (spoiler alert) totally saves my butt later. It also supports the DDR3/2133 XMP profile of my G.Skill Ripjaws Z RAM.

The Core i7-3820 isn't an unlocked part, but I can still get an easy Turbo Boost overclock to 4GHz with it, and it has to share a chassis with three Radeon HD 7970s, which put out a lot of heat. So I'm using Noctua's NH-D14 SE2011, my favorite air cooler from this month's roundup (page 50).

All these beefy components need room, air, and power. For the first two needs I'm going with NZXT's Switch 810 chassis, which is reviewed in this issue (page 84). It's big, roomy, good-looking, and has plenty of fan support. I especially like the pivoting drive-bay fan mounts that can aim cool air directly at the videocards, and I'm going to add a fan to the lower one.

I'm also going to need a powerful PSU with enough juice for my rig; Silverstone's Strider Gold 1,200W is fully modular and can support all three GPUs and my slightly overclocked proc, too.

A speedy 256GB Samsung 830 Series SSD makes for a good Windows drive, and a 3TB Seagate Barracuda will sit in the Switch 810's hot-swap bay.

HARDWARE HIGHLIGHTS

ASIDE FROM a few details, this is a pretty standard build, so I'll skip the complete step-by-step and just call out a few interesting steps on the way. For the most part, you'll be fine following the case and motherboard instructions.

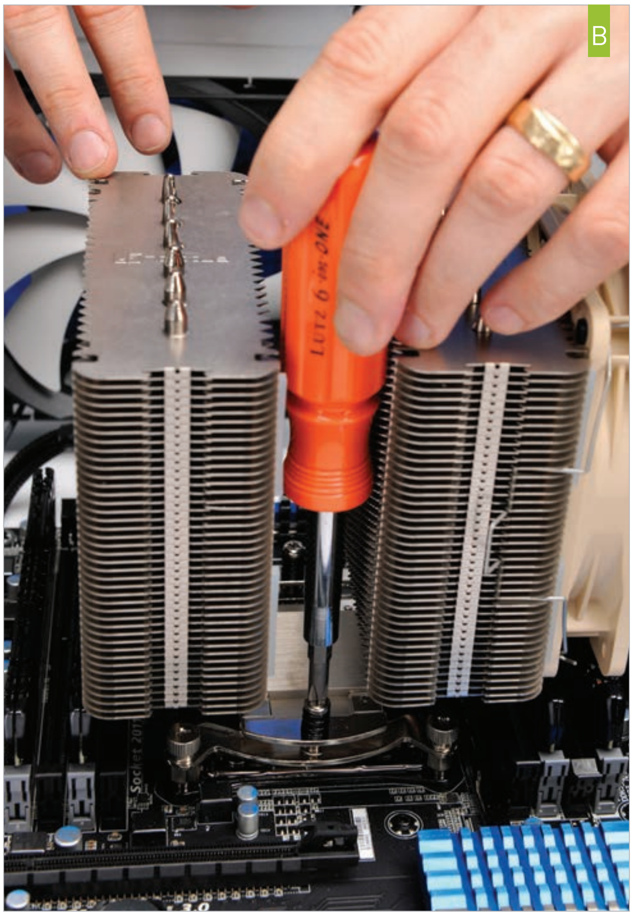
1 INSTALLING THE COOLER

THANKS TO THE INTEGRATED backplate on the LGA2011 socket, it's not necessary to preinstall the CPU cooler before you install the motherboard. I put the CPU and RAM in my board and installed it in my case before I put in the cooler. One word of caution: If you're not using the RAM I used, make sure the heat spreaders aren't too tall; the Noctua NH-D14 cooler overhangs some of the RAM slots and can conflict with oversize RAM heat spreaders.

To install the NH-D14, first mount the four double-ended thumbscrews into the screws on the socket, then install the crossbeams and secure them with the included nuts **(image A)**.

Once the mounting bracket is in place, apply a dot of thermal paste the size of a small pea to the center of the CPU. Remove the cooler's center fan and place the cooler on the heatsink such that the spring screws line up with the posts on the crossbar. Tighten the spring screws, alternating screws each few rotations until the screws stop turning **(image B)**. Reattach the fan, making sure it's pointing the same direction as the front fan, plug both fans into the Y-cable, and plug that into the CPU_FAN header.

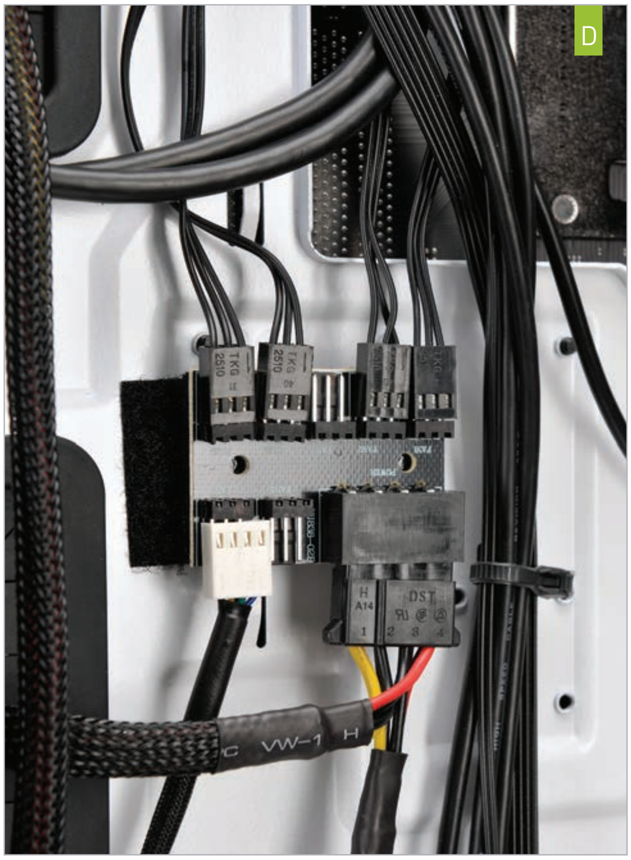
A


B

2 ADDING A FAN

THE SWITCH 810 HAS a decent array of stock fans, but I have three GPUs super-heating the air, and I want to make sure they're adequately ventilated. I really like the pivoting fan mounts on the backs of the two hard drive cages, but only the top one has a fan preinstalled, so I'm going to add one to the bottom cage, as well.

Remove the thumbscrews at the top and bottom of the drive cage and pull it out of the chassis. Use fan screws to install the fan into the mount—only the top two mounting holes will be used **(image C)**. Adjust the fan so that it's pointing up where the GPUs will be and reinstall the cage into the case. Run the fan cable behind the motherboard tray and plug it into the fan connector there **(image D)**.

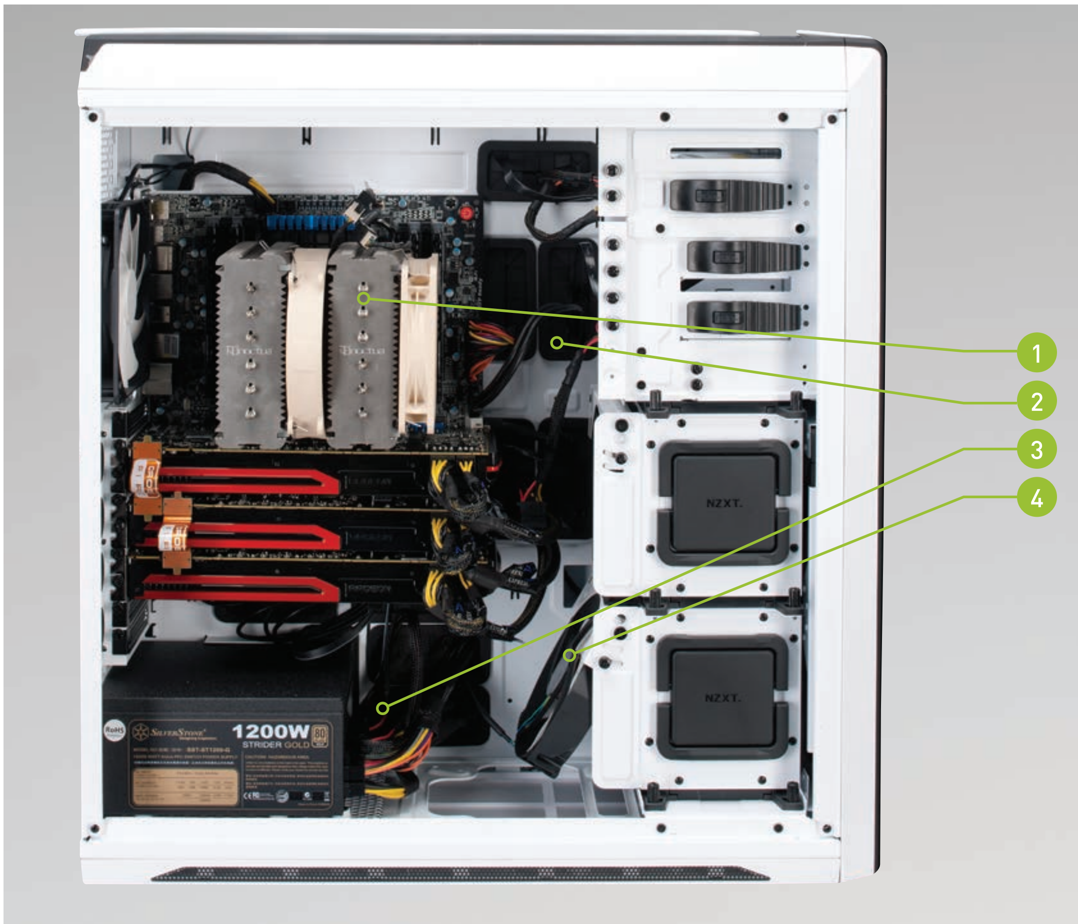


3 INSTALLING ALL THE GPUS

BECAUSE THEY TAKE up so much room in the case, I installed the GPUs last—after I installed the DVD burner, hard drive, and SSD; after I mounted the PSU and connected all the power cables; even after I connected the case's front panel connectors.

Install the first GPU into the topmost x16 PCIe slot **(image E)**, then the other two in order. You should have three PCIe power cables from the PSU, with an 8-pin and a 6-pin power connector on each. Connect one cable per videocard, making sure to power both the 8- and 6-pin connectors on each card.

Use one CrossFire bridge to connect the first and second videocards, and another to connect the second and third, as shown **(image F)**.



1. Noctua's NH-14 cooler may be huge, but it's effective.

2. The NZXT Switch 810's motherboard tray features plenty of cable-mounting cutouts.

3. Silverstone's Strider Gold 1,200W PSU is fully modular, so there's no excess cabling interrupting airflow.

4. These pivoting drive-cage fans are key for getting maximum airflow directly to the GPUs.

JOINING THE ONE PERCENT

ONCE THE MACHINE was built and the wiring tidied up a bit, I fired it up and installed Windows and all the drivers, then I updated the BIOS to the latest version and did a bit of overclocking. Well, my first attempt at updating the BIOS corrupted it. Fortunately the Gigabyte board automatically restored the BIOS from its backup, and I was able to successfully update that. A simple multiplier overclock brought the proc to 4GHz—not very ambitious, but very safe. I also made sure my RAM was set to its XMP profile timing of DDR3/2133. These efforts gave me modest improvements over the stock-clocked state in the CPU- and memory-bound benchmarks.

So how does my CrossFireX rig stack up? Against our aged zero-point it's a slaughter: anywhere from 15 to 32 percent faster in CPU-bound benchmarks, and a whopping 238 percent improvement in STALKER: Call of Pripyat and 92 percent in Far Cry 2. So to make things interesting, I also tested the rig against our 2011 Dream Machine.

In CPU tests, the Dream Machine clearly has the edge—namely, a 20 percent clock advantage. With its unlocked 2600K overclocked to 4.8GHz, it crushed the i7-3820 in this month's rig, which was a whopping 23 percent slower than its older rival in MainConcept Reference and 12 percent slower in Vegas Pro 9.

In graphics-bound tests, though, the Dream Machine is dethroned. The triple Radeon HD 7970s proved their mettle against even Superclocked GTX 580s, with 13 percent gains in Stalker and 24 percent in Far Cry 2. The triple 7970s are so powerful, actually, that they edge out the dual overclocked GTX 590s found in the CyberPower Fang III reviewed in this issue (page 76). That's triple CrossFireX beating quad SLI!

As if that weren't impressive enough, this rig puts out the second-highest 3DMark 11 Extreme score of any machine we've tested, at X7,619. That's just a tiny bit below the X7,785 set by the Maingear rig we tested in February 2012. And Unigine Heaven 2.5? Try 75.4fps with all settings maxed out. That's 5fps more than the dual Asus Mars II cards (quad GTX 580s) in the Maingear. For reference, the mighty Dream Machine's three 580 cards came in at X5,863 in 3DMark and 43.4 fps in Heaven.

True, the rig I've built lacks water-cooling, a Blu-ray drive, or scads of storage. It's also got a CPU with a modest overclock. But thanks to the extraordinary performance of its three Radeon HD 7970s, it's a hell of a lot of rig for under $3,400.

BENCHMARKS

	DM 2011	
Vegas Pro (sec)	2,191	2,502 (-12%)
Lightroom 2.6 (sec)	233	270 (-14%)
ProShow 4 (sec)	801	963 (-17%)
MainConcept 1.6 (sec)	1,394	1,819 (-23%)
STALKER: CoP (fps)	125.9	142.0
Far Cry 2 (fps)	177.5	219.5

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

All gaming benchmarks run at 2560x1600 resolution. Our 2011 Dream Machine consists of an Intel Core i7-2600K CPU @ 4.8GHz on a Gigabyte GA-Z68X-UD7-B3 motherboard with 16GB Corsair DDR3 and a Corsair H100 liquid-cooling system. It has three EVGA GTX 580 Superclocked GPUs and runs Win 7 Ultimate 64-bit on a pair of 240GB OCZ Vertex 3 SSDs in RAID 0.

REVIEWS

TESTED. REVIEWED. VERDICTIZED.

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CYBER-POWER FANG III BLACK MAMBA PAGE 76

CyberPower Fang III Black Mamba

One box, two systems, and lots of speed

An Azza Fusion 4000 enclosure accommodates a gaming system below and a more modest WHS box up top.

EVEN HIGH-END gaming rigs, believe it or not, can get pretty rote. In the parlance of our times, it's what's called a "first-world problem." It's a bit like being bored because you want to drive something other than your Ferrari or Lamborghini.

The solution to this problem in PC terms is CyberPower's Fang III Black Mamba box, which is anything but ordinary. The machine is literally a high-end gaming box with a second PC grafted on top of it. This is done using an Azza Fusion 4000 case that's big enough to take an XL-ATX board down below and a Mini-ITX board up top. Down below, CyberPower installs an Intel Core i7-3960X, 16GB of DDR3, an Asus Rampage IV Extreme board, and two overclocked EVGA GTX 590 Classified Hydro Copper cards. All this is cooled with a custom cooling solution, to boot. Storage is handled with a 2GB HDD and a pair of 120GB OCZ Agility 3 drives in RAID 0. RAIDed SSDs aren't new, but the case's support for four SSDs in quick-release trays, is, um, *très* cool.

CyberPower takes advantage of the cooling to overclock both the CPU and the GPUs. The CPU goes from its stock speed of 3.3GHz to a nice 4.5GHz, and the Hydro Copper cards are also clocked up enough to give the dual 590s a healthy speed advantage.

In our app benchmarks, the Fang III represents well against the super PCs we've tested lately, but it doesn't set any records. In a nutshell, the Fang III is fast, but there are faster (and more expensive) machines out there. It's in gaming benchmarks where the Fang III brings the pain. Amazingly, the machine steals a record in STALKER: CoP set way back in 2010 by a dual-CPU AVADirect box with quad GTX 580 cards. And the Fang III just barely misses breaking the record in our Far Cry 2 test. What about something more graphically strenuous? In 3DMark 11, the Fang III's score of X6,449 is bested by only the dual Asus Mars II–equipped Maingear PC from our February 2012 issue, which puts out an insane X7,785. In Heaven, the Maingear rig achieved 69fps while the Fang III sits with the silver at a very impressive 59fps. Mind you, that Maingear rig cost nearly $9,000. CyberPower gives you a damn-respectable second place for just $4,995 for the base unit and another $700 for the mini-me box on top. (CyberPower will leave the top empty if you want to fill it yourself.)

CyberPower equips the top rig with a liquid-cooled Core i3-2120, 8GB of RAM, a 2TB HDD, and Windows Home Server. There's no GPU, but the 300-watt brick should be able to run a decent midrange card if you really wanted to. The top rig isn't just bolted on top, either; both sections actually share space.

The real question is whether consumers are looking for such a beast. Call us crazy, but we can see the top rig being handy. Keep your gaming rig powered down for all but the most strenuous gaming and content creation tasks, but do most of your browsing and torrenting from the dead-silent top machine. If the lower machine has a failure, the top one is always at the ready. We'd probably opt for Windows 7 on the top instead of Windows Home Server 2011, but we can see the appeal of having a very fast WHS11 box up top, too.

Regardless of the PC on your roof, the gaming machine is quite fast—and quite affordable, when you consider that the GPUs and CPU are damn near $3,000 alone. –GORDON MAH UNG

BENCHMARKS

	ZERO POINT	
Vegas Pro (sec)	3,049	1,832
Lightroom 2.6 (sec)	356	240
ProShow 4 (sec)	1,112	736
MainConcept (sec)	2,113	1,353
STALKER: CoP (fps)	42.0	134.8 (+221%)
Far Cry 2 (fps)	114.4	219.0

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Our current desktop test bed consists of a quad-core 2.66GHz Core i7-920 overclocked to 3.5GHz, 6GB of Corsair DDR3/1333 overclocked to 1,750MHz, on a Gigabyte X58 motherboard. We are running an ATI Radeon HD 5970 graphics card, a 160GB Intel X25-M SSD, and the 64-bit version of Windows 7 Ultimate.

VERDICT 9 KICK ASS!

CyberPower Fang III Black Mamba

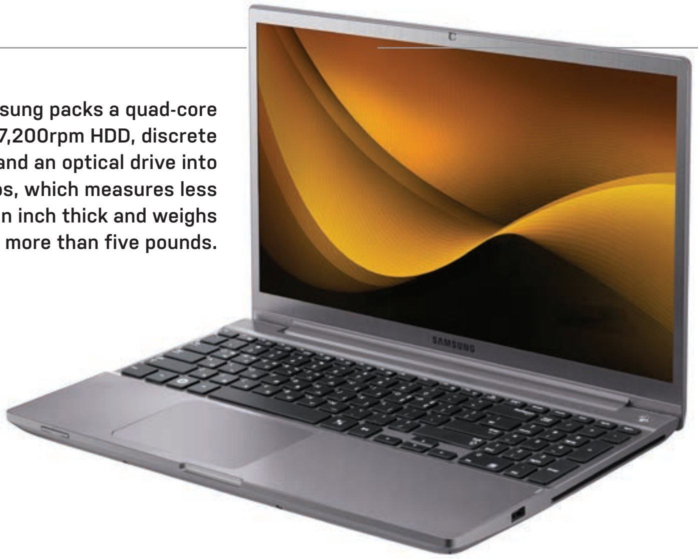
+ HOBBIT Fast; reasonably priced for the hardware you get; truly unique.

− BOBBIT Way too tall to fit under any desk other than the Jolly Green Giant's.

$5,700, www.cyberpowerpc.com

SPECIFICATIONS

Processor	Intel 3.3GHz Core i7-3960X OC'd to 4.5GHz / 3.3GHz Core i3-2120
Mobo	Asus Rampage IV Extreme / Zotac Z68ITX-A-E
RAM	16GB DDR3/1600 / 8GB DDR3/1600
Videocard	Two EVGA GeForce GTX 590 Hydro Copper in SLI / Integrated
Soundcard	Onboard / onboard
Storage	2x 120GB OCZ Agility 3, 2TB Hitachi HDD (7,200rpm) / 2TB HDD (7,200rpm)
Optical	LG Blu-ray combo drive
Case/PSU	Azza Fusion 4000 / Corsair 1,200 watt / 300 watt



Samsung packs a quad-core proc, a 7,200rpm HDD, discrete graphics, and an optical drive into the Chronos, which measures less than an inch thick and weighs little more than five pounds.

Samsung Series 7 Chronos

Because ultrabooks aren't for everyone

IT MIGHT SEEM like ultrabooks have overtaken the laptop landscape, what with all the attention they've received lately in the press and at CES, but there are still plenty of folks who prefer a more substantial laptop for general-purpose computing. These are the folks Samsung's Series 7 Chronos is aimed at.

Like its ultrabook brethren, which inevitably draw comparisons to the MacBook Air, the Chronos bears a strong resemblance to an Apple product: the MacBook Pro. The 15.6-inch laptop is just shy of an inch thick; its lid, display bezel, and palm rest are all made of silver brushed aluminum; the island keyboard is backlit; and it features a large, 4.2x3-inch glass touchpad with integrated right and left buttons. The Chronos is not the paragon of industrial engineering that Apple is known for (the edges and bottom of the rig, for example, are made of plastic), but it has an attractive, refined aesthetic and its build quality feels solid.

The Chronos also costs a lot less than a comparably equipped MacBook Pro. The model we reviewed, sporting a 2.2GHz Core i7-2675QM processor, 8GB of DDR3/1333, an AMD Radeon 6750M GPU, and a 750GB 7,200rpm hard drive (plus an 8GB iSSD for fast boot and app loading), is fully $500 cheaper than the closest 15-inch MacBook Pro—and that model is limited to 4GB of RAM, a 500GB 5,400rpm drive, and a 1440x900 display (vs. the Chronos's 1600x900). It's a no-brainer if you're into value.

Clearly, the Chronos has the chops for productivity apps, as evidenced by its parts loadout and benchmark performance. It ran circles around our admittedly aged zero-point gaming laptop in all the content-creation tests. The Chronos is less of a master at games, however, although gaming is not out of the question with the mid-level Radeon 6750M GPU. We achieved 42fps in Call of Duty 4 playing on a 1650x1050 external display with 4x AA. With AMD's Switchable Graphics, the GPU is enabled only when needed, thus preserving battery life. Indeed, the Chronos lasted almost five hours in our battery rundown test—that's within the range of the ultrabooks we've reviewed. Pretty impressive.

If you have a large DVD collection, you'll appreciate the Chronos's slot-load DVD drive. Image quality on the 1600x900 matte screen is generally good, although adjusting the screen forward or back much beyond 45 degrees results in considerable color distortion. The speakers are serviceable, but certainly not a selling point.

Our biggest gripe with the Chronos regards its trackpad. While the surface of it feels very nice to the touch, we found its behavior maddening at times—just moving the cursor would sometimes register as a click, causing windows to open or move, or text to be highlighted. And while typing, the cursor would occasionally find its way to some random point in the document. Sadly, these issues are not uncommon to trackpads, but they have the ability to tarnish the user's experience. A function key on the Chronos lets you disable the trackpad in favor of a mouse.

All in all, the Series 7 Chronos offers a well-rounded package for mainstream use at a reasonable price. –KATHERINE STEVENSON

BENCHMARKS

	ZERO-POINT	
Premiere Pro CS3 (sec)	899.0	660.0
Photoshop CS3 (sec)	131.0	88.3
ProShow Producer (sec)	876.0	699.0
MainConcept (sec)	1,782.0	1,414.0
Far Cry 2 (fps)	48.5	23.5 (-51.5%)
Call of Duty 4 (fps)	62.2	41.9 (-32.7%)
Battery life (min)	96.0	290.0 (+201.1%)

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Our zero point notebook is an Asus G73Jw-A1 with a 1.73GHz Intel Core i7-740QM, 8GB DDR3/1066, two 500GB Seagate 7,200rpm hard drives, a GeForce GTX 460M, and Windows 7 Home Premium 64-bit. Far Cry 2 tested at 1680x1050 with 4x AA; Call of Duty tested at 1680x1050 with 4x AA and 4x anisotropic filtering.

VERDICT 8

Samsung Series 7 Chronos

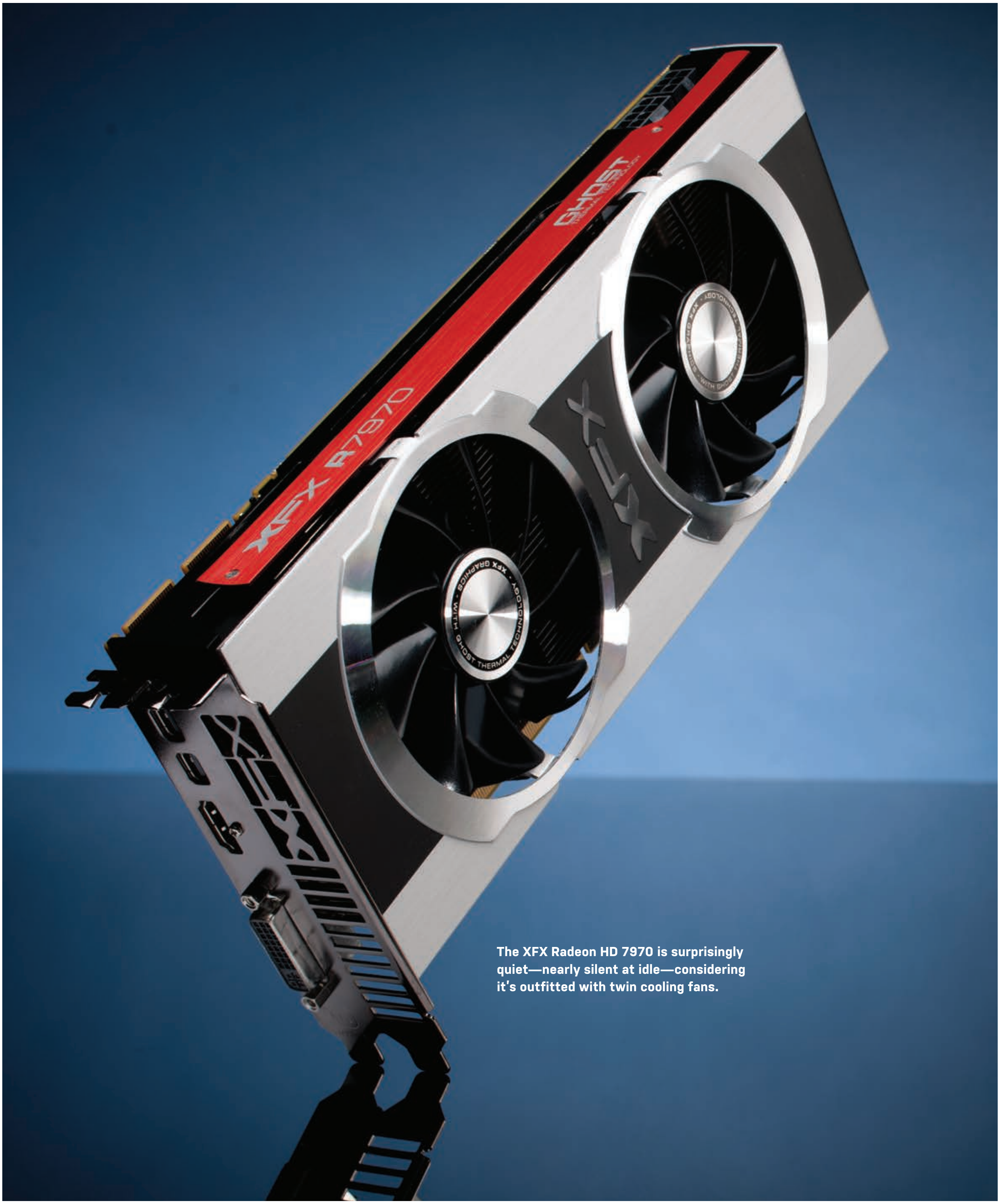
➕ **CHRONOS** Feature-rich; capable performer; subtly stylish; great battery life.

➖ **CHAOS** Buggy trackpad; poor vertical off-axis on screen.

$1,300, www.samsung.com

SPECIFICATIONS

CPU	2.2GHz Core i7-2675QM
RAM	8GB DDR3/1333
Chipset	HM65
Drives	750GB Hitachi HDD (7,200rpm), 8GB SanDisk iSSD
Optical	Slot-load DVD burner
GPU	AMD Radeon 6750M
Display	15.6-inch, 1600x900, LED-backlit LCD
Connectivity	HDMI out, Mini DisplayPort out, 2x USB 3.0, USB 2.0, Ethernet, Bluetooth, 802.11 a/g/n, headphone, 4-in-one card reader
Lap/Carry	5 lbs, 4.6 oz / 6 lbs, 4.6 oz



The XFX Radeon HD 7970 is surprisingly quiet—nearly silent at idle—considering it's outfitted with twin cooling fans.

XFX Radeon HD 7970 Black Edition

'We don't need no stinkin' reference design!' says XFX

IT'S NOT UNUSUAL to see factory-overclocked videocards ship with custom cooling solutions a few months after a GPU launches. But XFX didn't waste any time with its Radeon HD 7970 Black Edition—a factory-overclocked card with a custom cooling solution that aims to take the performance crown. Based on what we've seen to date, XFX has delivered the fastest single-GPU card on the planet.

The Radeon HD 7970 is AMD's latest GPU, with support for DirectX 11.1 and OpenCL 1.2. It's a brand-new architecture—completely different from past AMD GPUs—built on TSMC's 28nm manufacturing process and sporting a staggering 4.3 billion transistors. In AMD's reference design, the 7970's core runs at 925MHz, and its GDDR5 memory is clocked at 1,375MHz. XFX ups the ante significantly, pushing the core clock speed to a whopping 1GHz and running its 3GB of memory at 1,425MHz.

As you might imagine, the results are nothing short of amazing. We're seeing genuine performance milestones here, including a 3DMark 11 performance score higher than 8,000 (for a single GPU), Far Cry 2 hitting 100fps at 2560x1600 with 4x AA, and Batman: Arkham City heading north of 50fps at the same resolution and AA settings. On top of that, the idle system power is just 124 watts, and a dark idle (when Windows 7 blanks the screen) draws 110 watts. Push the card and you'll see system power consumption climb to 349 watts, but that merely puts its overall power draw into Fermi territory. XFX's Radeon HD 7970 Black Edition is substantially faster than EVGA's super-overclocked 3GB GeForce GTX 580 Classified, and it's outfitted with just two PCIe power connectors (one 8-pin and one 6-pin). EVGA's card requires three power connectors.

XFX's dual-fan custom cooler, housed within an attractive brushed-metal housing, looks much more elegant than most of the competition. Despite using two fans, this card was noticeably quieter at full load than XFX's Radeon HD 6970, and it was almost inaudible at idle.

Aside from carving its logo into the bracket, XFX took no liberties with the outputs: The mounting bracket has two Mini DisplayPort 1.2 connectors, one HDMI 1.4a, and a dual-link DVI. Use a combination of DisplayPort- and DVI-capable displays, and the card can support three-panel Eyefinity setups up to 2560x1600. Use one or more 1920x1200 (or lower res) monitors, and you can also tap the HDMI for a four-panel setup. And when DisplayPort 1.2 monitors and hubs ship, this card will be capable of supporting as many as six displays.

The XFX Radeon HD 7970 Black Edition has all the hallmarks of a winner: superb performance, relatively low power consumption, and better-than-average noise levels. It's pricey, at $600, but no more so than other cards in its class. If you crave the fastest single-GPU card in the world, it's here—and it includes the twin bonuses of easy multi-monitor support and high efficiency. **–Loyd Case**

BENCHMARKS

	XFX Radeon HD 7970 Black Edition	EVGA GTX 580 Classified	EVGA GTX 580 SC	XFX Radeon HD 6970
3DMark 11 Perf	**8,393**	7,321	6,747	5,750
3DMark Vantage Perf	**32,813**	28,559	26,936	24,453
Unigine Heaven 2.5 (fps)	**29**	23	22	17
Shogun 2 (fps)	**29**	24	22	19
Far Cry 2 / Long (fps)	**100**	92	85	75
HAWX 2 DX11 (fps)	120	**128**	120	73
STALKER: CoP DX11 (fps)	**39**	29	28	25
Just Cause 2 (fps)	**50**	48	41	31
Batman: Arkham City (fps)	**53**	47	45	36
Metro 2033 (fps)	**18**	17	15	14
Dirt3 (fps)	**64**	55	50	44
Core / Memory Clocks (MHz)	1,000 / 1,425	855 / 1053	797 / 1013	880 / 1375
System Power @ idle (W)	**124**	140	140	126
System Power @ full throttle (W)	349	385	344	**296**

Best scores are bolded. Our test bed is a 3.33GHz Core i7 3960X Extreme Edition in an Asus P979X Deluxe motherboard with 16GB of Corsair DDR3/1600 and an AX1200 Corsair PSU. The OS is 64-bit Windows Ultimate. All games are run at 2560x1600 with 4x AA except for the 3DMark tests.

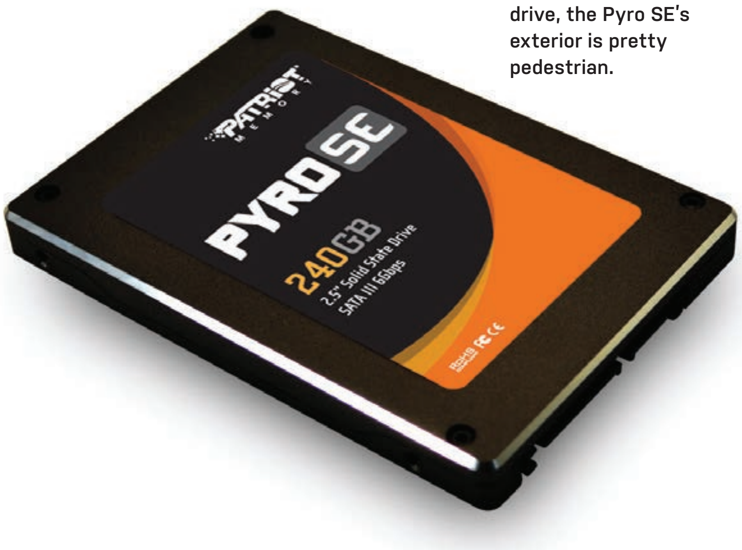
VERDICT 9 KICK ASS!

XFX Radeon HD 7970 Black Edition

+ CLARENCE CLEMONS Superb performance; efficient power usage; low noise; good multi-monitor support.

− KENNY G On allocation, so expect a back-order.

$600, www.xfxforce.com



For such a speedy drive, the Pyro SE's exterior is pretty pedestrian.

Same as it ever was: Intel's drive enclosure. Very different: the controller inside.

Solid State Shakeup

The venerable SandForce SF-2281 does battle with a new 6Gb/s SATA controller

Let's play a little game. We have three solid state drives—one each from Patriot, OCZ, and Intel. Two of them are powered by the ubiquitous SandForce SF-2281 controller, and the other marks the consumer debut of a new 6Gb/s SATA controller. Guess which drive has the new controller?

If you guessed the Intel drive, time for a spit-take. It's the OCZ drive that's got the new controller, and the Intel drive that is SandForce-powered. What in the name of the MLC gods is going on? –NATHAN EDWARDS

PATRIOT PYRO SE 240GB

Back in October 2011, we reviewed the 120GB Patriot Wildfire, the company's first SF-2281-based SSD. With 32nm Toshiba asynchronous NAND, the Wildfire was a solid, if unremarkable, drive—awesome compared to nearly every other drive, but not quite up to the standard set by Corsair's Force GT, OCZ's Vertex 3, or OWC's Mercury Extreme Pro. With the Pyro SE, Patriot hopes to change that.

The Force GT, Vertex 3, and Mercury Extreme Pro have one thing in common that the Wildfire lacked: 25nm synchronous NAND. Now a Patriot drive has the same stuff. The 240GB Patriot Pyro SE uses 16 128Gb modules of Micron 25nm synchronous NAND. Can the smaller process and synchronous NAND help the Pyro SE keep pace with the best SF-2281 SSDs on the market?

Yes. The better NAND pushes the Pyro SE past its stablemate and into the rarified air at the top of the SandForce-powered heap. With sequential read and write speeds at 482MB/s and 300MB/s, respectively, as measured by CrystalDiskMark, the Pyro SE is about as fast as the OWC Mercury Extreme Pro, and its 4KB random write speed, at over 91,000 IOPS, is the fastest we've ever seen from a 6Gb/s SATA drive. The synchronous NAND makes the most impact on sequential write speeds, offering a 40–50MB/s boost over the asynchronous NAND in the Wildfire.

As with all top-tier SandForce SF-2281-powered drives, the Pyro SE is optimized for small random-write cycles; in sequential tests, Samsung's 830 Series SSD holds the crown.

The Pyro SE is priced competitively with other drives that use the same NAND and controller, like the OWC Mercury Extreme Pro, and it performs competitively, too. If you're looking for a top-tier SSD with a SandForce controller and speedy 25nm synchronous NAND, the sparkly-gray Pyro SE is just as good as the sparkly-blue OWC drive. So get whichever one matches your rig better.

VERDICT **9** KICK ASS!

Patriot Pyro SE 240GB

$450, www.patriotmemory.com

INTEL 520 SERIES 240GB

For every season, there is a spin. Intel's first consumer SSDs, the X-25M series, didn't have the fastest performance, but they gained a reputation for reliability. We had high hopes for Intel's 320 Series SSDs, which turned out to be really great 3Gb/s SATA drives, at a time when everyone else was shipping 6Gb/s drives. When Intel did ship a 6Gb/s SATA drive, the 510 Series, it used a Marvell controller, not an Intel one. Well, Intel has finally released its second 6Gb/s consumer SSD series, and it's powered by... SandForce?

Yep. The 520 Series may ship in Intel's familiar 7mm aluminum chassis with a 2mm black spacer, but inside it's running the same SandForce SF-2281 as everyone else. It does use 25nm Intel synchronous NAND and Intel-validated firmware, which Intel says makes it better, faster, and more reliable than plain-Jane SF-2281-based drives.

We'll have to wait and see if the reliability claim is accurate, but the "better and faster" is, well, kinda true. The 520 Series is certainly faster than SF-2281 drives that use asynchronous NAND. Compared to other drives with 25nm synchronous NAND, like Patriot's Pyro SE above, the differences are smaller. The 520's CrystalDiskMark sustained read speed of 470MB/s, for example, is 12MB/s slower than the Pyro SE, and in Iometer the 520 gets 4,000 fewer IOPS on our random write test. Real-world scores in PCMark 7 and Premiere Pro are virtually identical to the Pyro SE, while the Intel drive lags behind in PCMark Vantage, an older test.

We're not 100 percent sure OCZ knows what "infused" means.

Intel reassures us it hasn't given up on its own controllers, and Intel's upcoming 20nm IFMT tech should offer big improvements in NAND density and performance in the second half of the year. So we have that to look forward to.

The 520 series may not be very special, but at least it's up to current-gen standards, and it replaces the kinda crappy Marvell-powered 510 series. On the other hand, $510 for a 240GB drive is a lot, considering the Patriot Pyro SE is $50 cheaper and just as good. Intel's betting that its reputation for reliability still means something to SSD buyers. We think it does, but does it mean they'll pony up an extra 50 bucks?

VERDICT 9

240GB Intel 520 Series

$510, www.intel.com

BENCHMARKS

	Patriot Pyro SE	Intel 520 Series	OCZ Octane	Samsung 830 Series SSD
Capacity	240GB	240GB	512GB	256GB
CrystalDiskMark				
Sustained Read (MB/s)	482	470.6	445.4	**506.4**
Sustained Write (MB/s)	300.3	299	315.5	**398.5**
AS SSD				
Seq. Read (MB/s)	**506.7**	502.6	432.2	502.6
Seq. Write (MB/s)	**295.2**	288.3	285.9	164.1
4KB Read (IOPS)	4,986	**5,655**	5,546	5,513
4KB Write (IOPS)	**14,179**	14,123	10,417	12,800
ATTO				
64KB File Read (MB/s)	**443.24**	422.81	408.57	405.85
64KB File Write (MB/s)	487.9	490.29	287.02	**515.05**
IOMETER				
4KB Random Write	**91,171.26**	87,713.73	22,073.97	35,329.48
Max Access Time (ms)	41	39	429	**31**
Premiere Pro Encode Write (sec)	424	423	425	**420**
PCMark Vantage x64 HDD	61,686	49,622	57,030	**62,168**
PCMark 11 x64 SST	**5,305**	5,312	4,945	5,257

Best scores are bolded. Our current test bed is a 3.1GHz Core i3-2100 processor on an Asus P8 P67 Pro (B3 chipset) running Windows 7 Professional 64-bit. All tests used onboard 6Gb/s SATA ports with latest Intel drivers.

OCZ OCTANE

Remember Indilinx? The company's Barefoot SSD controller was the first really good solid-state controller. It was one of the first controllers to offer Trim support, as well as sustained read and write speeds near 200MB/s, and it ruled the roost until SandForce's SF-1200 controller leapt ahead of Barefoot's capabilities. The company's next-gen controller was delayed, and in March 2011 OCZ bought the company. It's been nearly a year, but OCZ finally has a consumer drive with the new Indilinx Everest controller. Was it worth the wait?

The 512GB Octane drive sent to us by OCZ contains 16 256Gb 25nm Intel synchronous NAND modules, two 2Gb Micron DDR3 SDRAM cache modules (512MB total), and, of course, the Indilinx Everest controller, all in a standard 2.5-inch SSD form factor. In CrystalDiskMark, it averaged 445MB/s sustained reads (35–40MB/s slower than the SandForce drives we've tested) and 315MB/s sustained writes (15MB/s faster). Its single-queue-depth 4KB random writes were competitive at around 5,600 IOPS, but at QD32, it only put out 22,000 IOPS—Samsung's 830 Series does 35,000 and the Patriot Pyro SE does over 90,000. The Octane's maximum response time in Iometer, at 429ms, is a bit worrying, too—its competitors have max response times of around 40ms. The Octane's video encoding performance was within seconds of the other drives, and its PCMark Vantage and PCMark 7 scores, though lower than the rest, weren't too shabby.

So where does that put the Octane among today's 6Gb/s SATA SSDs? It's better than drives with the Marvell 9174 controller, like Plextor's M2 and Crucial's M4, and even some SandForce-powered SSDs with cheaper asynchronous NAND. But aside from a slight write-speed advantage, the OCZ Octane falls behind SandForce drives with synchronous NAND in most benchmarks, and its random-write speeds at depth are much, much lower.

The biggest problem with the OCZ Octane is Samsung's 830 Series, which is available in the same capacities (aside from the Octane's unmatched 1TB model), is faster in every single benchmark, and is cheaper than the Octane—by $100, at the 512GB capacity. The Octane has more-than-reasonable performance and we like the fact that it has the new Indilinx controller, but given its price and the existence of cheaper, better alternatives, it's not the best bang for your buck.

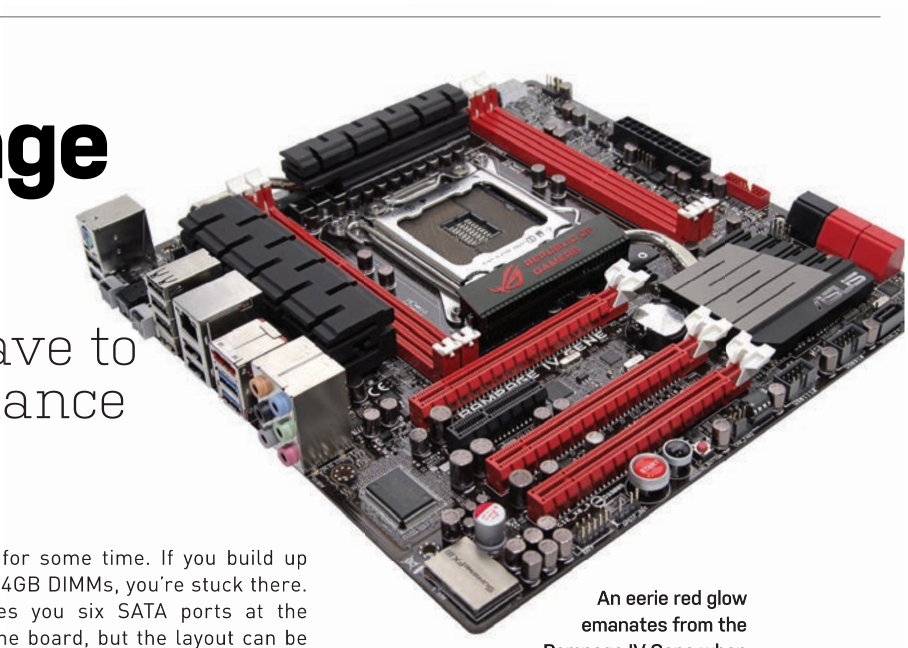
VERDICT 8

OCZ Octane

$900, www.ocztechnology.com

Asus Rampage IV Gene

MicroATX doesn't have to mean micro performance


An eerie red glow emanates from the Rampage IV Gene when it's switched on.

FINDING A GOOD motherboard is easy. Finding a good microATX motherboard, however, can be more of a chore. That's because motherboard vendors have almost always associated microATX with budget needs. In addition to losing a couple of expansion slots and some PCB board space, you almost always lose features such as SLI, CrossFire, RAID , premium audio, and other add-ons to help push the price down.

That's not the case with Asus's new Rampage IV Gene. Made for premium LGA2011 chips, the Rampage IV Gene caters to builders who want performance but in a microATX form factor. As a Republic of Gamers board, it's no surprise that the Rampage IV Gene emphasizes features and functionality. RoG boards are Asus's cream of the crop.

That's not to say the Rampage IV Gene has *all* the features of the company's Rampage IV Extreme board. While the Extreme is truly tweaked for, well, extreme overclockers, the Rampage IV Gene seems better suited to building a compact gaming rig with the intent of normal overclocking, not setting records using liquid-helium.

One thing you will give up with this board, besides the extra expansion slots, is memory capacity. Asus was only able to get four DIMMs on this quad-channel-memory board. That means any RAM choice you make is going to have to tide you over for some time. If you build up with four 4GB DIMMs, you're stuck there. Asus gives you six SATA ports at the front of the board, but the layout can be confusing. Two are on Intel's SATA 3Gb/s controller, two are on Intel's SATA 6Gb/s controller, and another two are on an Asmedia AS1061 controller. Basically, read the manual to see where to install your drives.

Asus's RoG boards also put a premium on onboard audio. Good onboard audio is normally an oxymoron, like military intelligence, but the audio on the Rampage IV Gene is actually decent. The codecs are Realtek parts, but Asus has walled them off to help reduce electrical noise. The company has also licensed Creative's EAX for the board. You have to activate the drivers to get the support, but we verified that all current EAX versions are supported. We also did some close listening tests using a set of JH Audio JH13 in-ear monitors while copying a copious amount of data across the USB and USB 3.0 ports. Asus's partitioning of the audio circuits seems pretty effective, as we didn't hear the data actually moving. Is it as good as an add-in board? No, but frankly, with the state of PC audio, you probably wouldn't notice the difference. We also tested the board with two GeForce GTX 580s and all four DIMMs populated, with no issues on that front, either.

The board's performance was quite good and helped ease our concerns over the Asus P9X79 Deluxe board that's been our pick of the litter. We've run a few X79 boards, and the P9X79 board's comparatively fast scores had us wondering if something was amiss (cough! cooked BIOS). Now seeing this Asus board perform as speedily, using a public BIOS, we're convinced that Asus is just onto some performance trick that the other board makers aren't privy to yet. We're basically talking 5 to 10 percent more speed for free from the Asus boards, which ain't nothing to sneeze at. For example, look at the benchmark chart below and see how the Asus boards dominate the Intel DX79SI. How long will this performance advantage last? We're not sure, and perhaps the other vendors will cry foul, but for now, we'll take the free speed.

Overall, the board is fast, it's compact, and it's everything you'd need to snap into your microATX chassis of choice. –GORDON MAH UNG

BENCHMARKS

	Asus Rampage IV Gene	Asus P9X79 Deluxe	Intel DX79SI
PCMark 7 Overall	3,546	**3,662**	3,489
Valve Particle (fps)	295	**299**	260
SiSoft Sandra (GB/s)	39.88	39.9	38.9
SATA 6Gb/s read (MB/s)	**523.4**	508	499.9
SATA 6Gb/s write (MB/s)	233.2	224	**252.2**
USB 3.0 read (MB/s)	**240**	198	202.3
USB 3.0 write (MB/s)	**178**	175	168.5
SLI Compliance	Yes	Yes	Yes
32GB Compliance	No*	Yes	Yes

We tested all three motherboards with a 3.3GHz Core i7-3860X, 8GB of DDR3/1600, GeForce GTX 580, Western Digital Raptor 150, and 64-bit Windows 7 Professional. SATA 6Gb/s speeds were tested with an OWC Mercury Extreme SSD. USB 3.0 testing was tested with a UASP-complaint USB cabinet and SATA 6Gb/s Patriot Wildfire SSD. *Requires eight DIMM slots to test.

VERDICT 9

Asus Rampage IV Gene

+ GENE HACKMAN Fast, capable, and well outfitted for a MicroATX board.

– GENE SIMMONS Would be nice to have eight DIMM slots and SATA layout can be confusing.

$290, www.asus.com

The Xigmatek Elysium is one of the few cases to support HPTX motherboards, like the EVGA SR-2 we used in our 2010 Dream Machine.

See those white fan LEDs? They're super easy to set up, thanks to a built-in fan-light hub inside the chassis.

Cooler Master's Storm Trooper has some pretty details, including a brushed-aluminum badge at the bottom of the chassis.

The Battle for Full-Tower Dominance

Are any of these massive steel frames good enough to house your components?

Any power user knows that finding the right home for your precious rig is almost as important as the parts that populate it. Full-tower cases are particularly appealing, because buying one is like buying a mansion versus a studio apartment. There are no excuses for shortcomings or half measures in this market; with all that space to work with, vendors have ample opportunity to deliver plenty of features. So we were glad to get our hands on three new full-towers: the NZXT Switch 810, the Xigmatek Elysium, and the Cooler Master Storm Trooper. Here's how each of them rates. –**ALAN FACKLER**

XIGMATEK ELYSIUM

Xigmatek's Elysium is fricking huge. At 24.3 inches tall, 9 inches wide, a whopping 26.1 inches deep, and weighing more than 34 pounds, this monstrous full-tower enclosure is among the largest we've seen. Its cavernous interior can accommodate HPTX, XL-ATX, E-ATX, ATX, microATX, and Mini-ITX mobo configurations—and you can mount a second PSU at either the top or bottom for those power-hungry HPTX builds. The Elysium has 10 PCIe slots, and you can fit a 12.2-inch GPU with room to spare. But all that interior vertical space is a double-edged sword: We had to mount our PSU in the top bay, because its 8-pin ATX 12V cable wasn't long enough to reach the motherboard from the bottom.

Twelve 5.25-inch drive bays adorn the front of the case. Two four-bay drive cages in the lower half are secured with thumbscrews and can be moved or removed, but the two 12cm front fans mounted to them must go along for the ride. Drives must be secured inside the cages with screws, and all the bays are secured using finicky plastic mechanisms. The case weirdly lacks any 2.5-inch drive mounts, so you'll need to spring for your own adapters if you're using SSDs.

The top panel features two USB 3.0 inputs, two USB 2.0 inputs, one eSATA, and headphone and audio jacks, all of which can be hidden by a plastic sliding door. There's also a hot-swap SATA dock up top. Xigmatech provides an impressive collection of stock fans: Two 12cm front fans, a 14cm rear fan, and a jumbo 20cm side fan held system temps to an average of 23 degrees Celsius—that's a full 10 degrees lower than the NZXT Switch and 14 degrees cooler than the Cooler Master Storm Trooper.

The Elysium isn't limited to the stock fan loadout: There's room at the top and bottom for three 12cm or 14cm fans, or two 20cm fans. Two small circuit boards turn one 4-pin Molex input into six 3-pin fan headers. There's no onboard fan controller, though, and mounting the PSU will block one fan mount no matter where you place it. If water is your preferred cooling method, the Elysium can accommodate up to a 420mm radiator at the top or bottom (depending on where you put the PSU).

The Elysium is almost too big for the typical build, the finicky plastic latches securing the drive bays feel cheap, and the absence of 2.5-inch drive mounts is peculiar. But if you're looking for a really big enclosure that can accommodate dual power supplies and oversize motherboards, the Elysium is cool, quiet, and attractive.

VERDICT 9 — **Xigmatek Elysium**
$220, www.xigmatek.com

COOLER MASTER STORM TROOPER

Cooler Master's Storm Trooper is trimmed with a light-gray, rubber-coated plastic liner that covers the front and top of the case, creating a nice contrast with the black steel frame. It looks even better once its red fan LEDs switch on. It's smaller than both NZXT's Switch 810 and Xigmatek's Elysium, measuring 23.8 inches high by 9.8 inches deep by 22.8 inches long and weighing 31.7 pounds. But this enclosure has plenty of room, boasting nine PCIe slots and space for even the longest consumer videocards.

Check out the size of that lower grommeted cutout—we were able to fit our entire hand through it!

Nearly every plastic panel on the NZXT Switch 810 can be removed with light finger pressure.

The 14cm fan next to the hard drive cage can be tilted to direct its airflow.

Nine 5.25-inch drive bays occupy the front of the chassis, with a hot-swap 2.5-inch drive bay at the top of the stack. Two hard-drive cages with toolless trays can accommodate 2.5-, 3.5-, or 5.25-inch drives, and a second drive cage at the bottom of the chassis can handle four additional 2.5-inch drives. The trays aren't shoddy, but they do feel less sturdy than what we've come to expect from Cooler Master.

A massive rubber-coated handle is molded into the front of this enclosure's lid, with large slanted vents behind that, so don't set anything on top of this box. A slanted I/O panel in front of the handle harbors two USB 3.0 ports, two USB 2.0 ports, mic and headphone jacks, an eSATA port, an oversize power button, a reset switch, and a three-speed fan controller. Although the Storm Trooper's motherboard tray has only three grommeted cutouts, we found cable management to be a straightforward affair, thanks to one of the biggest cable-routing cutouts we've ever seen.

In our thermal tests, the Storm Trooper's stock fans (two 12cm front, one 20cm top, and one 14cm rear) didn't keep our build quite as cool as the Xigmatek or NZXT cases did. If you prefer to water cool, the Storm Trooper includes three grommeted hose cutouts in back, and it can support two 240mm radiators (at the top and bottom); alternatively, you can swap out the rear exhaust fans with a 120- or 140mm radiator.

Cooler Master's engineers lavished the Storm Trooper with details, including slide-out dust filters top and bottom, removable foot pegs with aluminum bases, and a convenient hold above the hard drive cage for easy optical drive cable routing. And, as if they read our minds, Cooler Master is developing a white version of this case that will include a side window. The white version, however, will carry the Storm Stryker badge, presumably to avoid drawing the attention of Lucas lawyers.

VERDICT 8

Cooler Master Storm Trooper

$190, www.coolermaster.com

NZXT SWITCH 810

NZXT's Switch 810 is aptly named: This toolless steel chassis is an excellent choice whether you're indulging in extreme air cooling, radical water cooling, or near-silent running. It's beautiful to behold no matter how you set it up, with white plastic panels that can be removed with a simple press of your fingertips.

The 22.3-inch-long by 23.5-inch-tall by 8.5-inch-wide chassis supports multiple platforms including ATX, microATX, Mini-ITX, E-ATX, XL-ATX, and Flex ATX mobo configurations. There's plenty of room inside, with nine PCIe slots running in parallel with four tube cutouts, and plenty of convenient cable-routing options. The Switch 810's motherboard tray features 10 rubber-grommeted cutouts and an oversize 8-pin cable-routing hole. There's enough room at the top of the case to fit a 60mm thick, 360mm radiator with push-pull fans. If you opt for a quiet configuration, you can slide the top-panel fan vents closed to reduce noise.

The Switch 810 features six toolless, pinch-to-slide hard drive trays in two removable HDD cages that can accommodate either 2.5- or 3.5-inch drives. The top cage is fitted with a pivoting 14cm fan, so you can angle the direction of its airflow. The lower cage is tooled to accommodate the same type of fan, so you can move the one or add a second. The 5.25-inch drive cage at the top of the case includes an optical drive bay that flips open when the drive tray extends and automatically closes when the tray retracts, and a slide-out tray can host a 2.5- or 3.5-inch hot-swap drive.

With its included rear, top, and front 14cm fans, the Switch 810 kept our test build slightly cooler than Cooler Master's Storm Trooper; but NZXT's offering came in a distant second to Xigmatech's Elysium. If that isn't enough to cool your build, the Switch 810 has room for two more 14cm fans on top, two at the bottom, one more in front, and one more interior fan for the second hard drive cage. NZXT's Switch 810 is an innovative, flexible chassis design with plenty of cooling options; a refined, sleek look; and a very reasonable $170 price tag. Well done, NZXT. Well done.

VERDICT 9 KICK ASS!

NZXT Switch 810

$170, www.nzxt.com

Hi-Fi/Lo-Fi Wi-Fi

From top shelf to bargain basement

The only way to tell the Linksys E4200v2 from the original E4200 is to flip it over and check the label on the bottom.

Yes, the EnGenius ESR300H is feature-limited; but we can't complain about its performance—or its price tag.

In our quest for sheer performance, we sometimes forget to take into account that not everyone has a budget that can accommodate a cream-of-the-crop product. So we decided to take a look at two very different wireless routers this time out. One is a high-priced dual-band model with all the bells and whistles; the other is an inexpensive single-band model that offers a feature we haven't seen in a while: upgradeable antennas. This is obviously not a head-to-head matchup. –MICHAEL BROWN

CISCO LINKSYS E4200V2

The original Linksys E4200 (you can read our review at goo.gl/TEfmG) delivered two 150Mb/s spatial streams on its 2.4GHz radio and three 150Mb/s spatial streams on its 5GHz radio (for theoretical throughput of 300- and 450Mb/s, respectively). This updated model features a new chipset that delivers theoretical throughput of 450Mb/s on both its radios.

So all the changes are under the hood—the enclosure's industrial design is identical, and that includes the lid that prevents us from plugging hooded Ethernet cables into the four-port gigabit Ethernet switch. We didn't encounter any problems getting the router to power up a 2.5-inch USB hard drive this time, but it could be because we switched to a newer 500GB drive (we had been using a Verbatim Clōn; we're now using a Western Digital My Passport Essential). There's a UPnP media server onboard, but the router is not DLNA certified. If network-attached storage isn't important to you, the USB port can be used to share a printer instead.

In terms of wireless performance, the E4200v2 proved to be considerably slower than our current Best of the Best pick, Netgear's WNDR4500, at all five of our test locations and on both the 2.4- and 5GHz frequency bands. On the other hand, the E4200v2 proved to be 30Mb/s faster than the WNDR4500 when the client and server were hardwired to the network. The Linksys router's USB port was dramatically faster than the Netgear's, too. But the WNDR4500 is faster where it counts, and its street price was $20 lower at press time.

VERDICT 7

Linksys E4200v2

$200 (street), www.linksys.com

ENGENIUS ESR300H

Aside from loading alternative firmware (DD-WRT or Tomato, for instance), the easiest way to upgrade a router's performance is to replace its antennas. That's impossible with most of the routers we see these days, because manufacturers are using either nonremovable antennas or they're putting the antennas inside the enclosure. So we were intrigued to see that EnGenius put upgradeable antennas on its extremely inexpensive ESR300H; this router boasts a street price of less than $45.

As you've probably guessed, you'll give up more than a few features in exchange for that low price tag. This is a single-band router with only a 2.4GHz radio, so we wouldn't recommend it for deployment in an environment crowded with other wireless routers operating on the same frequency band. The ESR300H also lacks a USB port, so you won't be able to share a printer or storage device over the network. But the feature you'll miss the most is a gigabit Ethernet switch—the switch on this router is limited to 100Mb/s. If you move a lot of large files around your network using wired connections, you'll find this router to be agonizingly slow.

As indicated in its model number, the ESR300H supports only two 150Mb/s spatial streams, so it delivers a maximum theoretical throughput of 300Mb/s. But it makes the most of its available bandwidth; in fact, it outperformed the Linksys E4200v2 at several locations. EnGenius's budget router delivered surprisingly strong range, too. If you don't need the 5GHz band and can tolerate the 100Mb/s switch, the ESR300H is an outstanding value.

VERDICT 8

EnGenius ESR300H

$45 (street), www.engeniustech.com

BENCHMARKS

	2.4GHz Band			5GHz Band	
	Linksys E4200v2	EnGenius ESR300H	Netgear WNDR4500	Linksys E4200v2	Netgear WNDR4500
Bedroom, 10 feet (Mb/s)	112.0	87.4	**150.0**	102.0	**133.0**
Kitchen, 20 feet (Mb/s)	85.4	90.7	**121.0**	82.4	**98.2**
Patio, 38 feet (Mb/s)	60.8	75.6	**108.0**	61.5	**79.2**
Media Room, 35 feet (Mb/s)	61.0	41.3	**69.0**	28.3	**48.2**
Outdoors, 65 feet (Mb/s)	15.8	17.4	**32.7**	2.7	**6.3**

Best scores are bolded. TCP throughput measured using JPerf. Additional benchmarking methodology at bit.ly/ajskdh.

Roccat Kone+ and Isku

These super-size peripherals get better together

When you think of computer peripherals, Roccat might not be the first company that comes to mind. The German company has only been selling mice and keyboards for a couple of years, and you won't find them in your local Best Buy—in the states, these parts are only available online. Still, we'd be surprised if that doesn't change in the near future. Read on to find out if Roccat should be on your radar. –**ALEX CASTLE**

KONE+ GAMING MOUSE

The first thing you notice about the Kone+ is the sheer size of it. It doesn't look that large in pictures, but when you hold it in your hands, it becomes apparent that this is one of the larger mice on the market. Lengthwise it's about the size of other long mice, like the Razer Mamba, but it's wider and taller throughout the whole body of the mouse. It comes with a set of adjustable weights, and is comfortable in the hand, as long as you prefer a grip where your palm rests on the mouse—if you don't, the Kone+ isn't the right shape for you.

The Kone+ has the button-count we've come to expect from a FPS or general-purpose gaming mouse. It has two well-positioned thumb buttons that are large and easy to hit, as well as dpi and profile controls. One feature you don't commonly see on gaming mice is the tilt scroll wheel. The feature, which allows you to tilt the scroll wheel to the right or left as additional buttons, is traditionally found on office mice, not gaming mice. We suspect that the reason for this is because the additional freedom of movement in the scroll wheel makes the regular downward click feel slightly less responsive, and we could have done without it on the Kone+.

The Kone+'s software suite is full-featured, with a manager for the onboard mouse profiles, color-control for the Kone+'s slick-looking light strips, and a very robust macro-editor. The laser sensor is 6,000 dpi and very sensitive, though we did find that it was prone to wigging out when it encountered lint or a hair on the mouse pad, to the point that it became a bit of a nuisance.

The Kone+ is a solid mouse, but in a very crowded market, its few drawbacks mean we can't heartily recommend it. We're looking forward to seeing Roccat's next entry in this category.

VERDICT 7

Kone+ Gaming Mouse

$100, www.roccat.org

ISKU GAMING KEYBOARD

They must have really big desks in Germany, because the Isku, like the Kone+, is enormous. It is very wide and, with the unremovable wrist rest, nearly 10 inches deep, making it by far the largest keyboard in our collection.

The overall build quality is solid, with nice-looking (if fingerprint-attracting) glossy black accents. We prefer mechanical keys, but the Isku's aren't bad at all, as far as dome-switch keys go. The blue lighting effects are nice, and the intensity can be adjusted with a button on the keyboard.

Speaking of buttons, the Isku's got plenty. With its expansive size, there's room for a full number pad, five macro keys, a full suite of media keys, and three "Thumbster" buttons below the space bar. The macro keys are recordable on-the-fly, and between the five profiles and the macro shift function you have access to more recordable macros than you'll ever need.

An original feature is the "Roccat Talk" set bonus, which allows the Isku and the Kone+ to work together, so you can shift the macros on the keyboard by holding down a mouse button, or vice versa. You can also bind a key on the keyboard to act as a dpi-dampening "sniper button." In the time we spent testing the peripherals, we didn't find a ton of uses for the feature, but it's a neat incentive to buy the matching set.

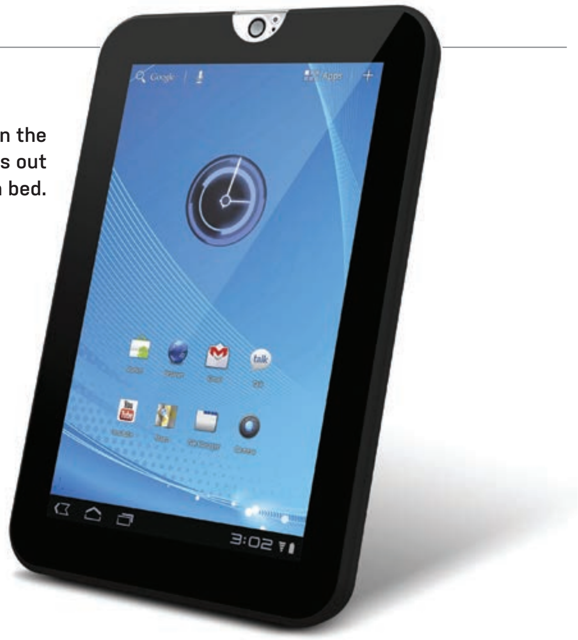
VERDICT 8

Isku Gaming Keyboard

$90, www.roccat.org

The Isku has all the wrist rest you could ever want, and then some.

The light strips on the Kone+ can display up to four customizable colors at once.



A screen-lock switch on the side of the Thrive 7" helps out when reading books in bed.

Toshiba Thrive 7"

Full-featured Honeycomb tablet tries to steal discount slates' thunder

TIMES ARE, LET'S SAY, challenging for anyone who makes a 7-inch tablet but doesn't also own some type of bookstore. The Kindle Fire and Nook Tablet could look the Thrive 7" square in the eye and say, "You're good, kid, but as long as we're around, you'll always be second best, see?" It hardly matters that the Thrive 7" has the full Honeycomb 3.2 OS, more storage, and superior screen resolution, because it also carries a price that's almost twice that of the Fire and without all the Amazon ecosystem advantages, to boot.

With that said, for those discriminating individuals who do appreciate the finer things in life, the Thrive 7" furnishes the highest resolution of a 7-inch tablet and costs a bit less than the Samsung Galaxy Tab 7 Plus. Graphics in games and videos on the Thrive 7" look crisp and finely detailed, with excellent black levels. It's a great tablet display for reading ebooks or websites.

On the downside to browsing the web, the Thrive 7" performs pretty poorly with web browser screen redraws and scrolling and exhibits demonstrable touch-response lag. Several other Honeycomb tablets we've tested also suffered from such problems to a degree belying their hardware specs, but the Thrive 7" felt particularly laggy, if only intermittently. Similar problems occurred with certain other apps, on the home screens and menu screens, and when waking up the tablet. These behaviors were only occasional, but still common. Benchmark tests also showed results inexplicably lower than other Tegra 2 devices with similar specs.

As interest in the 7-inch tablet form grows, the Thrive 7" offers something a little different. With a larger screen bezel than the Kindle Fire and a grippy plastic back panel, the Thrive is more comfortable to grasp with one hand. It's even a bit lighter than the Fire. However, the back panel has some give to it when pressed. Like the soft spot on top of a baby's head, it's probably fine, but it's a bit disconcerting.

As another plus, 7-inch tablets aren't nearly as awkward for taking photos as 10-inch tablets, but the discount 7-inchers don't offer cameras. Similar to many aspects of the Thrive 7", its cameras are a mixed bag. As in other tablets, the 2MP front camera should only be used for video-chat-type purposes, as its quality isn't very good. The 5MP rear camera features an LED flash and autofocus. In good lighting, the photos can look quite nice, and it has an effective macro mode for close-ups. However, the autofocus takes quite long to operate, ironically making it less likely that your hands will stay steady for the photo. The placement of the lens is also more suited for photos in portrait, rather than the more common landscape photos. Its 720p videos look pretty good for steady shots in good light, but they flicker and get distorted with fast motion and low light.

Toshiba's 10-inch Thrive featured a removable 23Wh battery, but the 15Wh battery in the Thrive 7" is not user replaceable. This makes the low-to-average battery life even less appealing. While we got 13 hours of infrequent use out of a charge, it lasted less than five hours with constant use. The unnecessarily bulky proprietary charger and cable don't help matters. Micro USB for charging, if you please!

While a promised update to Android 4 Ice Cream Sandwich will help the Thrive's case, we're not sure if it will clear up any of its performance issues that we don't always experience with Tegra 2 devices. But if you're looking for a more capable 7-inch Android than the mass market Fire and Nook, the Thrive 7" gives you more than you could bargain-hunt for. –MARKKUS ROVITO

SPECIFICATIONS

OS	Android Gingerbread 3.2.1
Processor	Nvidia Tegra 2 1GHz-dual core
Display	7-inch LED backlit, 1280x800 LCD
Capacity	16GB or 32GB with microSD expansion; 1GB RAM
Cameras	2MP HD webcam front; 5MP rear w/LED flash and autofocus
Video	720p video capture
Connectivity	Wi-Fi, Bluetooth 2.1, Micro HDMI, Mini USB 2.0, microSD
Battery	15Wh Li-ion, nonremovable
Dimensions	7.44 x 0.48 x 5.04 inches, 0.83 lbs.

VERDICT 6

Toshiba Thrive 7"

➕ **WEALTHY** Excellent display with high pixel density; good grip and lighter than the Kindle Fire; no annoying UI skin or bloatware.

➖ **WITHERED** Some laggy performance, especially in the browser; odd camera lens placement and long autofocus; no Micro USB charging.

$380 (16GB) or $430 (32GB), www.toshiba.com

Might and Magic Heroes VI

Might doesn't always make right

FOR THOSE OF YOU wondering, no, "Might and Magic Heroes" is not a typo. For the sixth installment of the venerated strategy-RPG hybrid series, Ubisoft has changed the name from "Heroes of Might and Magic" to "Might and Magic Heroes." This inexplicable rebranding is the perfect embodiment of Might and Magic Heroes VI's fatal flaw: It doesn't know what it is, or what it wants to be.

Heroes VI skews way more toward the role-playing end of the RPG-strategy spectrum—many of the management elements from previous entries have been "streamlined" out of existence. Resource management, though not entirely removed, is one such casualty, being pared down to four simple building blocks: gold, wood, ore, and crystals. This makes building towns much quicker and simpler, but unfortunately, it also makes the various factions feel much too similar to one another in their macro approach to town and kingdom growth strategy.

While easier to build, the tactical value of towns is more important than ever. In addition to providing your kingdom with troops and gold, each town has a zone of influence. Unlike previous games, where any structure could be hijacked at any point, in Heroes VI, mines and creature dwellings cannot be seized until the local town is captured. Furthermore, all of your entire kingdom's troops can be purchased from any single town or fort, cutting back on backtracking, but also completely removing the strategic value of troop and resource supply lines. This devaluation of individual structures and the increased importance of towns make exploration, once one of the pillars of the Heroes experience, feel like little more than filler between a series of grueling siege battles.

Nowhere is the linear progression of difficult battles more evident than in the game's single-player campaigns. Access to towns is limited, town growth is limited, and large areas of maps remain gated off—literally, by giant gates that only open once objectives are completed. Meanwhile, behind those gates, the insidious, cheating AI is amassing giant armies and piles of resources. And while uphill battles against an unfairly advantaged AI are practically a staple of strategy-game campaign modes, the lack of freedom and dearth of building strategies make the promise of getting hopelessly stuck a maddeningly frustrating inevitability.

That's not to say Heroes 6 is a bad game, it's not. It's just a bad strategy game. On the other hand, it's a very good tactical RPG. Hero management is more robust than ever thanks to a deep, customizable skill tree. While heroes fall into the two basic categories of Might or Magic, you're still free to spend ability points on whatever talents you choose. You can make a mighty warlord who issues powerful battle cries to empower his troops, a potent magician who can unleash devastating spells on his foes, or an all-around champion, mixing and matching Might and Magic skills to adapt to any situation. The choices are varied and satisfying, but the sheer amount of options and information can be overwhelming—especially for a first-time player.

Your army's units are equally diverse. There are five total factions—Haven, Inferno, Necropolis, Stronghold, and Sanctuary—each with seven troop types. Each troop type is upgradeable to a stronger variant, meaning there are 70 different unit types in all. Each unit has its own strengths and weaknesses, including unique skills and abilities. The myriad unit skills, in conjunction with your hero's character skillset, makes for a complex, tactical experience that rewards carefully selected battle strategies. Again, there's a massive learning curve here, made all the more challenging by a UI that's both hard to navigate and lacking in vital information.

So just what kind of game is Might and Magic Heroes VI trying to be? We're still not sure. But with a less strategy-focused style that will alienate longtime series fans and a complex system that will likely intimidate newer players, it's assuredly not the seamless blend of RPG and strategy that defined the Heroes games of yore.

–DAN SCHARFF

Heroes is at its best, and its worst, during climactic siege battles.

VERDICT 6

Might and Magic Heroes VI

+ MIGHT Deep, customizable hero skill trees; tons of gameplay; lots of unit variety.

– SLIGHT Limited building strategies; uneven difficulty; poor UI.

$50, might-and-magic.ubi.com/heroes-6/, ESRB: T

LAB NOTES

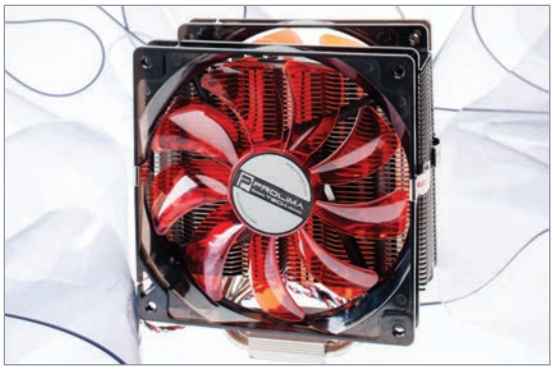
NATHAN EDWARDS **SENIOR EDITOR**

What about the Armageddon?

Our long-time Best of the Best air cooler doesn't seem to be available

WE'VE HAD THE Prolimatech Armageddon (with two 14cm Vortex fans) listed as our Best of the Best air cooler for quite a while now, and it's still one of the best coolers I've ever tested. Its performance is fantastic and its mounting bracket is one of the least pain-in-the-ass I've ever used. I got a mounting adapter from Prolimatech and tested the Armageddon on the LGA2011 test bed I used for this month's roundup, and its performance was still top-of-the-line—right up there with the Noctua DH-14 and the NZXT Havik 140 from a few months ago.

Alas, the Armageddon doesn't seem to be available for purchase anymore, and the Genesis, its successor, doesn't seem to have the kinks worked out of its LGA2011 mounting bracket yet. For now, I'm going to remove the Armageddon from the Best of the Best, but if you already have one, rest assured: The Armageddon is as awesome as ever (Prolimatech sells the bracket directly).



Michael Brown
Reviews Editor

I firmly believe you get what you pay for. But the EnGenius ESR300H router I reviewed in this issue left me wondering what other bargains I've missed. This $45 router performed much better than I expected. The absence of a gigabit switch is a deal killer for me personally, but not everyone needs that feature.

Richard Koscher
Art Director

I have been using Apple products for 20 years and can well remember the "end of days" period Apple went through in the 1990s. Although PCs still outstrip Mac sales, it feels very different today—Apple certainly isn't an underdog anymore, which I dislike. I always root for the underdog. Therefore I built my first PC this month, and by picking my own elements I felt a new sense of freedom.

Alex Castle
Online Managing Editor

I took one of the ultrabooks we reviewed in the February issue for a test run this month, and I've got to say: I'm impressed. I've never really cared for actually using a laptop on my lap, but the ultrabook is so light that I could really see it replacing the tablet as my on-the-couch device of choice.

Katherine Stevenson
Editor-in-Chief

If you don't already use the mobile web-browsing app Pulse, you might want to start, because MaximumPC.com is now part of the app's plethora of offerings. Select our site along with all the others you visit regularly, and Pulse arranges them in an enticing mosaic that makes browsing on a tablet or smartphone far more pleasurable than in a standard mobile browser.

Gordon Mah Ung
Deputy Editor

I recently couldn't decide which device to bring on a vacation, so I packed both a Toshiba Portégé notebook and a 10.1-inch tablet. I thought I'd use the tablet a lot more, but was surprised that the notebook was powered up 90 percent of the time—even on the plane.

LETTERS

WE TACKLE TOUGH READER QUESTIONS ON...

> PC Gaming Murder Plot
> Best of the Best RAM
> OEM Windows

New Suspects Emerge in Murder Plot

Great essay on "Who Tried to Kill PC Gaming?" in the February 2012 issue! You were close to solving the case, but missed the true identities. The three Console Brothers are really the Three Console Mistresses. They are sexy, flashy, and seductive and tried to steal the hearts of us PC Gamers. I admit I was taken aback at how easy they were to hook up with. However, in the end, they took my money and left me unsatisfied with sleepless nights. Finally, with my mouse between my legs, I crawled back to my PC and asked forgiveness. I feel liberated now with new adventures before me.

—Jere Mammino

Now, now, let's not forget that ruthless, evil organization called "The Social Network." Deucedly praying on the weaknesses of the unwary, they use tactics that take advantage of the complacency and torpor of less vigilant gamers. After all, why would one go through the effort of saving the world from nuclear threat when one could just give a small, furry animal to one's farmer-next-door? Why would one hunt down and bring to justice an evil threat to all that's just and good when one can influence an acquaintance to become one's neighbor in the hopes of increasing one's farm size? I agree that the size of the farm is indicative of power and influence, but when that power and influence is wasted on tallying the number of people you've "poked" and been "poked by," one is forgetting one's duty to mankind. These people *must* be brought back to the side of The Just and The Good. I refuse to believe they are forever lost to PC Gaming. They just need a new videocard.

—Mark M. Pinsent

Blizzard, EA, Ubisoft, and other DRM-laden asshats are strangling the PC scene. Limited activations, subscription pricing, and other hassles have turned it into the PC obscene.

PC games used to have more shelf space, and it was easy to find a box of shareware games for $1 per disk. Now the retail space is greatly reduced. That pricing and selection have gone to Steam and Pirate Bay, which are not ideal outlets for long-term collectors.

—Ben Colver

I'm My Own Tech Support

Every month or so you rehash the same questions or comments about re-activation of Windows OEM licenses (which is hardly ever denied), but nothing is ever mentioned about the other more important part of that license agreement, which states that whoever cracks the seal and installs the software is responsible for all support of that installation (other than Windows Update and Activation issues). So, unless you're ready to become a Microsoft support tech, one should think twice about how much will be saved by using OEM versions of Windows.

—Computer Joe

DEPUTY EDITOR GORDON MAH UNG RESPONDS: That's a good point, Joe. But it reminds me of a scene from the movie *City of Industry.* In it, Harvey Keitel is asked by his brother's ex-girlfriend why he doesn't go to the police for help. Keitel responds, "I'm my own police."

What's the Best RAM?

After reading the magazine for the last three years and following the website / podcast (when there is one) for the past year, I suddenly realized: Best of the Best doesn't include memory. Why not?

—Rini Mand

DEPUTY EDITOR GORDON MAH UNG RESPONDS: Thanks for reading and listening, Rini; we'll try to get back on schedule with the podcast one day. As far as Best of the Best for RAM, we have a fairly limited space for our BoB list in the magazine, so we don't currently include it. We generally recommend that you buy name-brand RAM based on the price and capacity that meets your needs. Why buy name-brand? If the RAM fails, it's the company standing behind it that you'll be dealing with, and you'll want a real company that will be here in two years. You don't get that kind of assurance from the no-name generic RAM people tend to buy because it's cheap.

To Patch or Not to Patch

Regarding Alex Castle's commentary in the February 2012 Lab Notes, I've been in the PC scene since before Wolfenstein was released. I've seen games released that had no bugs to be resolved (relatively few) and have also seen games put on retail shelves

↘ submit your questions to: comments@maximumpc.com

that wouldn't install correctly no matter what platform the user was running, unless a patch was obtained before attempting to set it up.

In my mind, a reviewer's job is to assess the performance of the game, which includes *all* aspects of the release. If it installs OK but only works with a couple of GPU setups, that is not, in my estimation, a finished game. Sending a semi-finished product out the door and expecting the buying public to accept it "as is" and wait for soon-to-be-released patches to fix problems is the height of arrogance on the part of the producers. These faults should not only be addressed by reviewers but should also downgrade the score given to the product in any discussion of the games.

Since I've seen over 20 years of these problems, I have taken the stance of not buying a game until it's been in retail distribution for at least a year. That serves my purposes twofold: I get a game that has a second- or third-release version, which has all the fixes already included, and in many cases I get a game that is cheaper than the original release because of the time passed.

—toxicavenger

> BLIZZARD, EA, UBISOFT, AND OTHER DRM-LADEN ASSHATS ARE STRANGLING THE PC SCENE

Build a (crippled) Battlefield PC

You've done it again. You're so delusional over an SSD's relative performance boost compared to an old mechanical drive that you've actually recommended a slower videocard in a gaming PC (Holiday 2011). Ditch the outrageously priced storage device ($220 for a measly 120GB SSD) and put that money toward a faster videocard. It's better to wait a second or two longer to get into the game and play at faster, smoother frame rates than it is to beat your friends into the game by mere seconds, yet be stuck running that game at less-than-easily obtainable frame rates. Forty-two frames per second in an online FPS is not acceptable when you can easily obtain better frame rates.

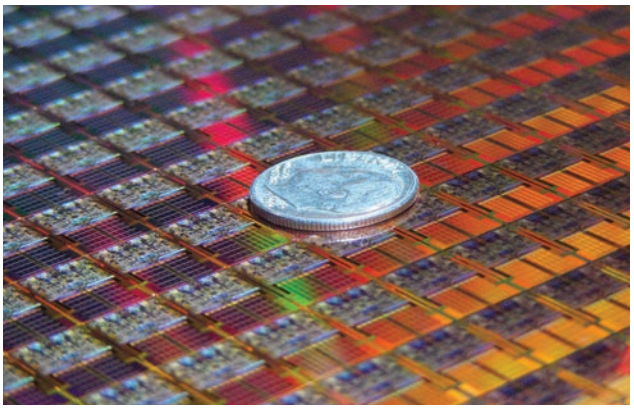
—Michael Circlestrafe

SENIOR SSD-CHOOSER NATHAN EDWARDS RESPONDS: At the time I built the Battlefield rig, the game hadn't come out, so I was working with beta game code and beta drivers. As I mentioned in the story, during the end of the open beta there actually wasn't a big advantage to using a GTX 580 over a Radeon HD 6970, so I went with the cheaper one. I always use an SSD when I can because it makes a big difference in the overall usability of a rig—more than the difference between the Radeon HD 6970 and GTX 580 at the time. Of course, the game is out now, and a better card will give you better performance, but even if I were building with a Radeon HD 7970, I'd still try to squeeze in an SSD.

[NOW ONLINE]

JOURNEY TO THE CENTER OF THE CPU

When it comes to CPUs, it's easy to get so caught up in the stats and benchmarks that you stop noticing the sheer technological splendor of the silicon powering your rig. For a little bit of perspective, check out our gallery of 15 up-close-and-personal photographs of processors—you might just be amazed by what a work of art is hidden in your computer. bit.ly/zFJ7eB



[NEXT MONTH]

COMING IN MAXIMUM PC's ARTISANAL, SMALL-BATCH MAGAZINE CRAFT MAY ISSUE

Build a PC on Any Budget

The time to DIY is now! We'll walk you through three PC configs at three different price points. You'll be cranking on a new rig in no time.

The Best of the Cloud

We all know about the seemingly endless potential of "the cloud," and its usefulness for buying, storing, and streaming our digital content. But who offers the best cloud portal—Amazon, Google, Microsoft, or Apple? We'll compare and contrast the bunch next month.

AMD's 3D Alternative

It might seem like Nvidia's 3D Vision is the only game in town, but AMD has its own brand of 3D tech. We'll tell you how it works and where you can find it.

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HARDWARE

MIDRANGE PROCESSOR

Intel 3.6GHz Core i7-3820

We lost a lot of sleep over this pick, but we think that for an enthusiast system, the Core i7-3820 quad part is a better pick than its cousins, the Core i7-2600K and 2700K. That's because the LGA2011 socket of the Core i7-3820 has more scale with its ability to eventually run up to hexa-core or octo-core chips. We also like the eight-DIMM configurations and PCIe 3.0 support. That's not to say the 2600K/2700K is lacking anything, but the 3820 is not only better for scaling up, but also for folks on a budget. We'll obviously revisit this decision when Ivy Bridge CPUs ship later this year. www.intel.com

THE REST OF THE BEST

High-End Processor
Intel 3.3GHz Core i7-3960X
www.intel.com

Budget Processor
Intel 3.3GHz Core i5-2500K
www.intel.com

LGA1155 Motherboard
Asus P8Z68-V Pro
www.asus.com

LGA2011 Motherboard
Asus P9X79 Deluxe
www.asus.com

Price-No-Object GPU
XFX Radeon HD 7970 Black Edition
www.xfxforce.com

Performance GPU
XFX Radeon HD 6970
www.xfxforce.com

Midrange GPU
EVGA GeForce GTX 560 Ti 448
www.evga.com

Budget GPU
XFX Radeon HD 6870
www.xfxforce.com

Performance Hard Drive
Samsung 830 Series SSD 256GB
www.samsung.com

Capacity Hard Drive
Hitachi Deskstar 7K3000 3TB
www.hitachigst.com

Air Cooler
Cooler Master Hyper 212 Evo
www.coolermaster.com

High-End Cooler
NZXT Havik 140
www.nzxt.com

Blu-ray Drive
Plextor B940SA
www.plextor.com

Full-Tower Case
Cooler Master Cosmos II
www.coolermaster.com

Mid-Tower Case
Corsair White Graphite Series 600T
www.corsair.com

Midrange Display
LG E2370v
www.lg.com

For even more Best of the Best entries, such as speakers and budget components, go to www.maximumpc.com/best-of-the-best.

THE GAMES WE'RE PLAYING

The Elder Scrolls V: Skyrim
www.elderscrolls.com/skyrim

Terraria
www.terraria.org

Batman: Arkham City
www.batmanarkhamcity.com

Star Wars: TOR
bit.ly/tVffnz

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